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TRANSACTIONS

OF THE

MASSACHUSETTS

MEDICO-LEGAL SOCIETY

VOLUME I.

1878–1888.

BOSTON:
Published by the Society.
1888.

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TRANSACTIONS

OF THE

MASSACHUSETTS

MEDICO-LEGAL SOCIETY

VOLUME I.—NUMBER 1.

1878.

CAMBRIDGE:
Printed at the Riverside Press.
1878.

PREFACE.

A PERUSAL of the Massachusetts statute concerning medical examinations and inquests will convince the reader that the operation of the theory of the law will be inefficient if the medical examiner is not properly qualified and thoroughly interested in his share of the responsibility. It is almost unnecessary to observe, also, that the radical change in the system of investigation involved in the new law will inevitably lead to confusion unless the whole body of medical examiners agree in and become conversant with the principles upon which this statute is based. In fact, these or similar suggestions occurred to several of the newly-appointed medical examiners very shortly after they had received their commissions; and in response to their invitation a large number of their associates met and organized into a society, whose objects and aims are clearly set forth in the constitution and code of by-laws herewith published.

It will, perhaps, appear to some that this association starts with an exclusive plan of membership; but a moment's reflection will convince those experienced in the organization of societies that a fruitful source of disaffection, and an obstacle to good work among its members, is often presented by the question, "Who shall become members, and who shall be excluded?" The organizers of the Massachusetts Medico-Legal Society cut the Gordian knot by basing the eligibility of members upon the fact that they have been admitted to and still are members of the Massachusetts Medical Society. This satisfies the question of qualifications so far as medical education is concerned.

The papers herewith published were presented at the first annual meeting of this society, and were read before the members of the Massachusetts Medical Society. Without further introduction we invite their careful reading, as these contributions announce not only the objects of the new law and the aims of the new society, but also the work of the first six months of newly-appointed officers organized into an association to preserve the records of their official doings.

We need scarcely add that any other community which may be dissatisfied with the mediæval coroner system may learn somewhat by the experience of Massachusetts.

August, 1878.

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THE LAW CONCERNING MEDICAL EXAMINATIONS.

AN ACT

TO ABOLISH THE OFFICE OF CORONER, AND TO PROVIDE FOR MEDICAL EXAMINATIONS AND INQUESTS IN CASES OF DEATH BY VIOLENCE.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows: —

SECT. 1. The offices of coroner and special coroner are hereby abolished.

SECT. 2. The governor shall nominate, and by and with the advice and consent of the council shall appoint, in the county of Suffolk not exceeding two, and in each other county not exceeding the number to be designated by the county commissioners as hereinafter provided, able and discreet men, learned in the science of medicine, to be medical examiners; and every such nomination shall be made at least seven days prior to such appointment.

SECT. 3. In the county of Suffolk each medical examiner shall receive, in full for all services performed by him, an annual salary of three thousand dollars, to be paid quarterly from the treasury of said county; and in other counties they shall receive for a view without an autopsy, four dollars; for a view and autopsy, thirty dollars; and travel at the rate of five cents per mile to and from the place of the view.

SECT. 4. Medical examiners shall hold their offices for the term of seven years from the time of appointment, but shall be liable to removal from office at any time by the governor and council for cause shown.

SECT. 5. Each medical examiner, before entering upon the duties of his office, shall be sworn and give bond, with sureties in the sum of five thousand dollars, to the treasurer of the county, conditioned for the faithful performance of the duties of his office. If a medical examiner neglects or refuses to give bond as herein required, for the period of thirty days after his appointment, the same shall be void and another shall be made instead thereof.

SECT. 6. The county commissioners in each county shall, as soon as may be after the passage of this act, divide their several counties into suitable districts for the appointment of one medical examiner in each district under this act; and when such division is made, shall at once certify their action to the secretary of the commonwealth, who shall lay such certificate before the governor and council; but nothing herein shall prevent any medical examiner from acting as such in any part of his county.

Sect. 7. Medical examiners shall make examinations as hereinafter provided, upon the view of the dead bodies of such persons only as are supposed to have come to their death by violence.

Sect. 8. Whenever a medical examiner has notice that there has been found, or is lying within his county, the dead body of a person who is supposed to have come to his death by violence, he shall forthwith repair to the place where such body lies and take charge of the same; and if on view thereof and personal inquiry into the cause and manner of the death, he deems a further examination necessary, he shall, upon being thereto authorized in writing by the district attorney, mayor, or selectmen of the district, city, or town where such body lies, in the presence of two or more discreet persons, whose attendance he may compel by subpœna if necessary, make an autopsy, and then and there carefully reduce or cause to be reduced to writing every fact and circumstance tending to show the condition of the body, and the cause and manner of death, together with the names and addresses of said witnesses, which record he shall subscribe. Before making such autopsy he shall call the attention of said witnesses to the position and appearance of the body.

Sect. 9. If upon such view, personal inquiry, or autopsy, he shall be of opinion that the death was caused by violence, he shall at once notify the district attorney and a justice of the district, police, or municipal court for the district or city in which the body lies, or a trial justice, and shall file a duly attested copy of the record of his autopsy in such court, or with such justice, and a like copy with such district attorney; and shall in all cases certify to the clerk or registrar having the custody of the records of births, marriages, and deaths in the city or town in which the person deceased came to his death, the name and residence of the person deceased, if known, or a description of his person, as full as may be for identification, when the name and residence cannot be ascertained, together with the cause and manner in and by which the person deceased came to his death.

Sect. 10. The court or trial justice shall thereupon hold an inquest, which may be private, in which case any or all persons other than those required to be present by the provisions of this chapter may be excluded from the place where the same is held; and said court or trial justice may also direct the witnesses to be kept separate, so that they cannot converse with each other until they have been examined. The district attorney or some person designated by him may attend the inquest and may examine all witnesses. An inquest shall be held in all cases of death by accident upon any railroad; and the district attorney or the attorney-general may direct an inquest to be held in the case of any other casualty from which the death of any person results, if in his opinion such inquest is necessary or expedient.

Sect. 11. The justice or district attorney may issue subpœnas for witnesses, returnable before such court or trial justice. The persons served with such process shall be allowed the same fees, and their attendance may be enforced in the same manner, and they shall be subject to the same penalties, as if served with a subpœna in behalf of the commonwealth in a criminal prosecution pending in said court, or before said trial justice.

Sect. 12. The presiding justice or trial justice shall, after hearing the tes-

timony, draw up and sign a report in which he shall find and certify when, where, and by what means the person deceased came to his death, his name if known, and all material circumstances attending his death; and if it appears that his death resulted wholly or in part from the unlawful act of any other person, he shall further state, if known to him, the name of such person and of any person whose unlawful act contributed to such death, which report he shall file with the records of the superior court in the county wherein the inquest is held.

SECT. 13. If the justice finds that murder, manslaughter, or an assault has been committed, he may bind over, as in criminal prosecutions, such witnesses as he deems necessary, or as the district attorney may designate, to appear and testify at the court in which an indictment for such offense may be found or presented.

SECT. 14. If a person charged by the report with the commission of any offense is not in custody, the justice shall forthwith issue process for his apprehension, and such process shall be made returnable before any court or magistrate having jurisdiction in the premises, who shall proceed therein in the manner required by law; but nothing herein shall prevent any justice from issuing such process before the finding of such report if it be otherwise lawful to issue the same.

SECT. 15. If the medical examiner reports that the death was not caused by violence, and the district attorney or the attorney-general shall be of a contrary opinion, either the district attorney or the attorney-general may direct an inquest to be held in accordance with the provisions of this act, notwithstanding the report, at which inquest he, or some person designated by him, shall be present and examine all the witnesses.

SECT. 16. The medical examiner may, if he deems it necessary, call a chemist to aid in the examination of the body or of substances supposed to have caused or contributed to the death, and such chemist shall be entitled to such compensation for his services as the medical examiner certifies to be just and reasonable, the same being audited and allowed in the manner herein provided. The clerk or amanuensis, if any, employed to reduce to writing the results of the medical examination or autopsy shall be allowed for his services two dollars per day.

SECT. 17. When a medical examiner views or makes an examination of the dead body of a stranger, he shall cause the body to be decently buried; and if he certifies that he has made careful inquiry, and that to the best of his knowledge and belief the person found dead is a stranger, having no settlement in any city or town of this commonwealth, his fees, with the actual expense of burial, shall be paid from the treasury of the commonwealth. In all other cases the expense of the burial shall be paid by the city or town, and all other expenses by the county, wherein the body is found.

SECT. 18. When services are rendered in bringing to land the dead body of a person found in any of the harbors, rivers, or waters of the commonwealth, the medical examiner may allow such compensation for said services as he deems reasonable, but this provision shall not entitle any person to compensation for services rendered in searching for such dead body.

Sect. 19. In all cases arising under the provisions of this act, the medical examiner shall take charge of any money or other personal property of the deceased, found upon or near the body, and deliver the same to the person or persons entitled to its custody or possession; but if not claimed by such person within sixty days, then to a public administrator, to be administered upon according to law.

Sect. 20. Any medical examiner who shall fraudulently neglect or refuse to deliver such property to such person within three days after due demand upon him therefor shall be punished by imprisonment in the jail or house of correction not exceeding two years, or by fine not exceeding five hundred dollars.

Sect. 21. The medical examiner shall return an account of the expenses of each view or autopsy, including his fees, to the county commissioners having jurisdiction over the place where the examination or view is held, or in the county of Suffolk to the auditor of the city of Boston, and shall annex thereto the written authority under which the autopsy was made. Such commissioners or auditor shall audit such accounts and certify to the treasurer of the commonwealth, or the treasurer of the county, as the case may be, what items therein are deemed just and reasonable, which shall be paid by said treasurer to the person entitled to receive the same.

Sect. 22. [Provides for service and execution of writs when the sheriff is disqualified to act.]

Sect. 23. [Provides for the performance of the sheriff's duties when the office of sheriff is vacant.]

Sect. 24. [Repeals all former legislation inconsistent with this act.]

Sect. 25. For the purposes of the appointment and qualification of medical examiners and the action of the county commissioners herein provided for, this act shall take effect upon its passage, and shall take full effect on the first day of July next.

Approved May 9, 1877.

MASSACHUSETTS MEDICO-LEGAL SOCIETY.

CONSTITUTION.

I. This organization shall be called "The Massachusetts Medico-Legal Society."

II. Its purposes shall be to elevate the official character of the medical examiner, and to assist him in the discharge of his duties; to collect and utilize such facts as have a medico-legal value; and to excite a general interest in the subject of forensic medicine, and to promote its successful cultivation.

III. The society shall consist of regular and associate members.

IV. Regular members shall consist only of those members of the Massachusetts Medical Society who have been duly appointed and qualified as medical examiners, or, being so appointed and qualified, shall hereafter be duly admitted to membership.

V. Associate members shall be those persons who shall from time to time be designated or chosen as such, in accordance with the by-laws of the society.

VI. The officers of this society shall be a president, a vice-president, a corresponding secretary, a board of censors, and (united in one person) a recording secretary and treasurer; all of whom shall be annually chosen by ballot from the regular members, and shall hold their respective offices for the ensuing year, and until others shall have been elected in their places.

VII. The president, the vice-president, and the two secretaries shall constitute an executive board, whose duty it shall be to carry out the purposes of the society as expressed by its by-laws or its votes.

BY-LAWS.

On Membership.

I. The privilege of *regular* membership shall be open to any member of the Massachusetts Medical Society who has been duly qualified as a medical examiner; but no one thus qualified shall acquire the rights and privileges of membership, unless he shall have subscribed to the constitution and by-laws before the first day of October, 1877.

Thereafter, qualified medical examiners who are members of the Massachusetts Medical Society, on approval by the censors of this society, may be elected to regular membership at any stated meeting.

The expiration, without renewal, of the commission of a medical examiner shall terminate his regular membership.

Associate members shall consist, in part, of the attorney-general of the

commonwealth, the several district attorneys in the State, and the members of the State Board of Health, during their respective terms of office. The Society may also, at any stated meeting, elect to permanent associate membership such persons versed in medical, legal, or technical science, as may be recommended by the committee on nominations.

All elections to membership shall be by ballot, expressed in "Yes" or "No;" and nine negative votes shall exclude a candidate from membership for one year.

The business of the society shall be managed, and the expenses paid, by the *regular* members.

The *associate* members shall attend only those meetings to which they shall be invited, and then shall have full liberty to participate in all scientific or professional discussions, and to present communications.

II. A fee of two dollars shall be paid by each regular member at the time of his admission. He shall also pay from time to time any *pro rata* assessment which shall be necessary to meet such expenses as have been authorized or incurred by votes of the society.

Every member shall forward to the corresponding secretary a report, as full and complete as possible, of each case which shall receive his official attention. The reports for each calendar year must be forwarded on or before the first day of February of the succeeding year.

On Meetings.

III. The *stated* meetings shall be held on the same day and at the same place as the stated meetings of the councilors of the Massachusetts Medical Society; the annual meeting being on the same day as the annual meeting of said councilors. At the annual meeting the election of officers shall take place, and the reports of the officers and of standing committees shall be received.

Special meetings may be called by authority of the executive board, and *shall* be called upon a *written* request signed by five regular members.

Fifteen members shall constitute a quorum for the transaction of business; but a less number may adjourn the meeting, or may hear and discuss communications.

IV. The different items of business shall take precedence in the following order: —

Calling the meeting to order.
Reading and correction of secretary's record.
Report of corresponding secretary.
Report of treasurer.
Report of censors.
Reports of standing committees.
Election of officers and of new members.
Appointment of standing committees.
Reading of appointed papers, with discussion and action thereon.
Voluntary communications, with discussion and action thereon.
Reports of special committees.

Incidental business.
Appointment of special committees.
Introduction of newly-elected officers and members.
Adjournment.

Official Duties.

V. There shall be one censor from each county (fourteen). They shall organize as soon as possible after their election, with a chairman and secretary selected from their own number. At least four votes shall be essential to the validity of any action of the board. This board of censors shall meet at the same place and on the same day as the stated meetings of the society, and as much oftener as circumstances may require. The secretary of the board shall notify the individual members of each meeting, shall keep an accurate record of all their proceedings, and shall report the same to the society at the annual meeting. The censors shall, at their discretion, recommend for admission to this society any member of the Massachusetts Medical Society who shall hereafter be qualified as a medical examiner.

They shall exercise a constant and careful supervision, shall at once notify the executive board of improper or unbecoming conduct on the part of any medical examiner or of any member of this society, and shall report the same to the society at a meeting called for the purpose. They shall ever use all the honorable means which they can command for the purpose of preventing the confirmation and appointment of any incompetent or unworthy person as medical examiner.

VI. The executive board, in addition to duties already assigned to it, shall be the committee of arrangements for all the meetings, and shall prepare and present at the annual meeting a report of the work of the medical examiners for the previous year.

VII. The president, the vice-president, the recording secretary and treasurer, and the corresponding secretary, shall perform in their respective offices such duties as custom, or the votes of the society, shall assign to them. At the annual meeting in each year, the president shall nominate for confirmation by the society the following committees, each to consist of three members: namely, a committee on publication, a committee on the law of medical examiners, a committee on nominations.

VIII. The committee on publication shall, at its discretion, cause to be published, in such manner as the society may direct, any paper or report which shall be referred to it for that purpose.

IX. The committee on the law of medical examiners shall, under instructions from the society, seek from competent authority information as to the proper interpretation of the doubtful points of any existing law under which medical examiners may be called to act. The committee shall also, when directed by the society, ask for such legislative action as time and experience shall show to be desirable or necessary for the medical examiner.

X. The committee on nominations shall propose at any stated meeting the names of persons whom it would recommend for permanent associate membership, the same being eligible under the by-laws.

On Censure and Expulsion.

XI. Every member shall be liable to a vote of censure or expulsion for cause shown by the censors; but no such vote shall be allowed to pass without the assent of a majority of the regular members present, the said majority to include in no case less than twenty votes.

Should the censors deem it their duty to investigate the conduct of any member of the society, they shall forthwith give him notice of the fact, with some sufficient reason for their intended action. They shall, also, receive and consider any statements, explanations, or evidence, which he may choose, within a reasonable time, to offer in his own behalf.

Should the board of censors then prefer charges of improper or unbecoming conduct against the said member, he shall, for the time being, forfeit all rights in the society, excepting that he may be present at a special meeting called for the purpose, at which the said charges shall be stated in full, with the evidence by which they are supposed to be justified and affirmed; and the accused shall then and there have an opportunity to be heard in his own defense, after which he shall retire. The society shall proceed to dispose of the case by conviction or otherwise, and shall fix a penalty, if need be. The action of the society shall be communicated to the accused in writing by the recording secretary without delay.

Alteration of Constitution and By-Laws.

XII. Any article of the constitution or by-laws may be altered or amended, or any new article may be added, by a two-thirds vote of all the *regular* members present at either of the stated meetings; provided that, at some previous stated meeting, full notice of the proposed change or addition shall have been given in writing to the recording secretary, and that he shall have read the said notice to the society.

Form of Declaration to be signed by Members.

XIII. At the time of his admission, every member shall sign the following declaration: —

"I hereby accept and subscribe to the constitution and by-laws of the Massachusetts Medico-Legal Society, as now adopted or hereafter amended."

MASSACHUSETTS MEDICO-LEGAL SOCIETY.

OFFICERS AND STANDING COMMITTEES FOR 1878-79.

PRESIDENT.

ALFRED HOSMER . . . . . of Watertown.

VICE-PRESIDENT.

THEODORE F. BRECK . . . . . of Springfield.

RECORDING SECRETARY AND TREASURER.

ROBERT AMORY . . . . . of Brookline.

CORRESPONDING SECRETARY.

FREDERIC WINSOR . . . . . of Winchester.

CENSORS.

J. F. A. ADAMS,
T. F. BRECK,
E. C. COY,
F. W. DRAPER, Secretary.
D. B. N. FISH,
J. B. KING,
A. E. PAINE,
W. M. PARKER,
J. G. PINKHAM,
S. D. PRESBREY, Chairman.
J. L. SULLIVAN,
C. C. TOWER.

COMMITTEE ON PUBLICATION.

S. W. ABBOTT, G. W. SNOW, F. W. DRAPER.

COMMITTEE ON LAW OF MEDICAL EXAMINERS.

F. A. HARRIS, J. R. BRONSON, G. S. OSBORNE.

COMMITTEE ON NOMINATIONS.

J. G. PINKHAM, J. L. SULLIVAN, C. C. TOWER.

REGULAR MEMBERS.

S. W. ABBOTT, Wakefield.
J. F. A. ADAMS, Pittsfield.
ROBERT AMORY, Brookline.
C. A. BEMIS, Medway.
T. F. BRECK, Springfield.
J. B. BREWSTER, Plymouth.
J. R. BRONSON, Attleborough.
C. A. CARLTON, Salem.
N. S. CHAMBERLAIN, Marlborough.
E. C. COY, Montague.
M. F. DELANO, West Bridgewater.
F. W. DRAPER, Boston.
JEROME DWELLY, Fall River.
J. F. DYER, Gloucester.
OTIS FERNALD, Haverhill.
D. B. N. FISH, Amherst.
J. C. GLEASON, Rockland.
CHARLES HADDOCK, Beverly.
F. A. HARRIS, Boston.
B. H. HARTWELL, Ayer.
J. L. HILDRETH, Cambridge.
J. G. S. HITCHCOCK, Foxborough.
D. W. HODGKINS, Brookfield.
C. C. HOLCOMBE, Lee.
A. R. HOLMES, Canton.
ALFRED HOSMER, Watertown.
Y. G. HURD, Ipswich.
J. C. IRISH, Lowell.

H. A. Jewett, Northborough.
Henry Johnson, New Bedford.
J. B. King, Nantucket.
A. D. Kingsbury, Needham.
W. D. Lamb, Lawrence.
E. P. Miller, Fitchburg.
D. W. Miner, Ware.
James Morison, Quincy.
G. S. Osborne, Peabody.
A. E. Paine, Brockton.
W. M. Parker, Milford.
John Pierce, Edgartown.
J. G. Pinkham, Lynn.
S. D. Presbrey, Taunton.
J. M. Rice, Worcester.
R. B. Root, Georgetown.
Ira Russell, Winchendon.
H. L. Sabin, Williamstown.
G. W. Snow, Newburyport.
J. L. Sullivan, Malden.
C. C. Tower, Weymouth.
J. H. Waterman, Westfield.
J. W. Winslow, Easthampton.
Frederic Winsor, Winchester.

ASSOCIATE MEMBERS.

D. W. Bond, Esq., Northampton.
Henry I. Bowditch, M. D., Boston.
H. P. Bowditch, M. D., Boston.
E. G. Cutler, M. D., Boston.
R. T. Davis, M. D., Fall River.
Thomas Dwight, M. D., Boston.
R. H. Fitz, M. D., Boston.
C. F. Folsom, M. D., Boston.
Asa French, Esq., Braintree.
Richard Frothingham, Boston.
John C. Gray, Jr., Esq., Boston.
W. B. Hills, M. D., Cambridge.
J. C. Hoadley, Lawrence.
O. W. Holmes, Jr., Esq., Boston.
A. H. Johnson, M. D., Salem.
George Marston, Esq., New Bedford.
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INTRODUCTORY ADDRESS,

DELIVERED JUNE 11, 1878.

BY MEDICAL EXAMINER ALFRED HOSMER, M. D.,

President of the Society.

THE programme which announces the arrangements that have been made for the current anniversary of the Massachusetts Medical Society presents an unaccustomed feature, and intimates the existence of an organization hitherto unknown, namely, the Massachusetts Medico-Legal Society. To-day that organization asks a kindly recognition, and seeks admission to the large circle of associations whose origin and preservation are due to the intelligence and industry of thoroughly educated and devoted medical men; and of which it may be said that they are at the same time the evidence and the means of a broader and better culture and a more active progress in science. By the power of combination they are the strength of our profession, and, through the salutary influences which they cannot fail to exert, become indispensable elements in the safety of the commonwealth.

The objects of this new society are briefly stated in the second article of its constitution in the following language: —

"Its purposes shall be to elevate the official character of the medical examiner, and to assist him in the discharge of his duties; to collect and utilize such facts as have a medico-legal value; and to excite a general interest in the subject of forensic medicine, and to promote its successful cultivation."

In deference to the wishes of the executive board, I shall attempt to set forth the importance of these several purposes. Although it is not possible to suspend the operation of that law which obliges the common man to speak common things, I hope to utter some word which shall eventually secure the good will, sympathy, and efficient coöperation of all who have a correct appreciation of the departure which is the essence of this whole movement, one of whose products is the medical examiner. That official owes his birth to the pressing and unavoidable necessity which had arisen for making an entire change in that method of initiating certain legal proceedings in which the late coroner was at times tempted to take so busy and undignified a part. He was

created by a legislative act which may fairly be called revolutionary, for it abolished every trace of an ancient system that was firmly incorporated into the usage of many generations, and which, in its old age, instead of gracing itself with those qualities which would make it venerable and strong, disgraced itself by the exhibition of a degree of corruption that decency and integrity could no longer tolerate. As a consequence, the coroner was required to pay on demand the debt ot unworthy ambition, and to make a compulsory exit. Forcibly impressed by the overpowering weight of executive decree, he discovered for himself a special phase of the law of gravitation. But at this point the claims of simple justice must not be forgotten. Although the name of coroner was so often accepted as the synonym of incompetence, which was bad, or of dishonor, which was worse, there were memorable exceptions, notably among physicians who held the office, and who saved for the old order of things what little there remained to it of good repute or of utility to the public.

Thus an immense advance had been made in the direction of reform; yet it was evident that a fatal mistake would be committed unless it were assumed that what had been accomplished by the powers resident in the State House was only initial and not final. The new system could be aptly compared with a vigorous infant, born to a cordial welcome, endowed with a certain tenacity of life, readiness for growth, and capacity for development, but which without intelligent care and that opportunity which is its natural right is doomed to an imperfect life, and is defrauded of the possibilities to which it might have attained. If this movement were left alone at the point to which it had been brought by the legislature and the governor and council, the community could never have derived from it the full benefit which it is capable of yielding; disappointment and disrepute would have overtaken its projectors and advocates; it might have forfeited all claim to the name which was its early strength, and which justified and secured the measures that it demanded; it would have been a substitution, of uncertain value, instead of a genuine reformation. In view of these considerations, as soon as the executive had made the appointments which were required by that act which in its very first and shortest section effected the extinction of the coroner, attention was immediately directed to the needs of the medical examiner, especially in connection with the conditions upon which depended his complete success in an untried line of duty and action.

Official quality is but the exercise and expression of personal character, and the perfection of the former will be in inverse proportion to the defects of the latter. Any scheme looking towards the elevation of the official quality of the medical examiner in a general sense must deal with him directly as an individual. With that idea, this society pro-

poses, in the first place, to protect him against the dangers of isolation, which so encourages degeneration and alienation and tends to produce an individuality composed of the most vicious elements: of self-conceit, a thing of luxuriant growth that thrives best upon a barren soil; of wrong-mindedness in much that relates to processes of thought and of logic; of error in much that relates to matters of fact. On the other side, it will open to him all the advantages of association, without which firm and symmetrical development is scarcely possible for the ordinary man. Within its circle he must acquire that true and exact self-appreciation which comes only of frequent and forcible contact with equals and superiors. In all difficult and unsettled questions which concern him as an officer, he will be able to hold his opinions in equilibrium with the average judgment of his official brethren. In all his methods he can be guided by the example of the most competent and most accomplished. He will be enabled to increase his knowledge rapidly and readily by the addition of the best ideas of all those whose thoughts and studies have the same general scope and purpose as his own. The rule of his official conduct will be a code of ethics, not arranged by himself, but an utterance which unites in itself the purest voices of the best men. If necessary, his *morale* will be reënforced upon the principle by which the man who, in a single-handed combat, would fail to gain any reputation for bravery may become an efficient soldier in the ranks if flanked on each side by a good fighter. And the cultivation of courage is not a thing of secondary importance. This quality used to be designated by a term that is in close etymological relation with the word virtue. In it certainly lies the possibility of many virtues. Without it let no one think of honesty and its derivative, individual consistency. Even imperfect honesty, if the phrase may be allowed, is a disqualification for which there is no possible compensation.

From that point of view which regards intellectual things it is easy to see the benefits which will accrue from the formation of a society. With useful subjects, discussion and debate are an invigorating form of mental exercise, and encourage precision in the processes of thought. Distinctness and exactness cannot be asserted of any conception until it has been expressed in clear and intelligible phrase. Perhaps in the realm of the immaterial there prevails a law analogous to that which determines propagation in the human species, so that every idea must acknowledge a double parentage, known or half known. At any rate many a brain has been fertilized and stimulated into fruitful activity by the force of a suggestion opportunely dropped. Competition and congregation quicken both motions and emotions. A race against time will not bring out the best speed, and cheers come only from a crowd. It is believed that the medical examiner has entered upon a new career with all the impetus that comes of an enthusiasm which is substantial and

not spasmodic, and that, whatever he may achieve, his aim will not be below the level of that which his ablest colleague may attain.

The society realizes that, if it would acquire all the benefits of combination, it must not simply stand for a result which is obtained by the arithmetical process of adding together the elements of which it is to be composed, but must represent something like the phenomena of a chemical union, which shall produce some qualities unknown in the constituents, and lead to some new expression of force. It will endeavor to confer upon membership such value as will attract those medical men whose tastes and education interest them in its objects. It will strive to give such a position to the medical examiner that it will not be in vain that the office seeks the strongest in our ranks, more properly among those not yet arrived at the middle period of life. It will attempt to establish for the appointment the reputation of a professional promotion, and as a vacancy may now and then occur, using its influence to secure a substitute who shall be superior to the original, it will certainly do something towards improving the official quality of the medical examiner.

But these matters are prospective, and of less immediate importance than the necessity of furnishing at once that which shall relieve the inexperience of the new officer, and render some aid in the discharge of his duties. While this object must always hold a high place among the purposes of the society, the obligation which it imposes can never be more pressing than it now is.

In his official capacity the medical examiner represents the commonwealth, who, in the powers with which she has invested him, has given us the measure of her confidence and expectation. The former must not be abused, and the latter must not be disappointed. As the very first preparatory step he must know the provisions of Chapter 200 of the Acts of 1877, which defines and confers his authority, and determines the modes in which it is to be exercised. But to read language as a grammatical combination of words is one thing, while it is quite another to reveal its true and intended meaning by a proper interpretation. The General Court has not always declared its will in expressions of such perspicuity that all thinking men have been agreed as to the particular shade of thought which has moved it to action. It is possible that the excellent law which is designed to regulate medical examinations and certain proceedings subsequent thereto may not be clear and explicit at all points. And in anticipation of any doubts and differences of opinion that in this connection may arise in the minds of medical examiners, attention will soon be asked to an exposition of this subject from one of our associate members who has a parental interest in the statute, and will speak with the advantage of having known it in the embryonic state. In this matter it is best that the medical

examiners should realize and remember their dependence upon another profession. And if at any other time than that of some urgent necessity they shall find themselves attempting to translate some legislative dialect into plain English, let them imagine an autopsy in the hands of an attorney, or ask the value of any opinion which a counselor at law should offer upon a difficult question in scientific medicine. Important official relations with the lower courts ought to place within easy reach advice and assistance from competent judicial sources.

Having thus obtained the best possible definition of his position under the law, and of the functions which appertain to his office, the medical examiner will discharge his duties with a facility and success which will depend upon his skill in exposing for inspection the various parts of the body, and his ability to recognize and appreciate any deviations from the normal standard of structure. Though he cannot command all the advantage with which the accomplished pathologist would approach such work, from the instructions of the latter he may derive very great assistance and may learn the most expeditious manner of supplying any defects that exist in his own knowledge of morbid anatomy. A part of his business is to make a scientific investigation, the field of which is the human body. He must be able to differentiate the true pathological changes which are in some way associated with one or more forms of what we call disease; firstly, from those conditions which depend solely upon the mode of dying or the circumstances under which death occurs; and, secondly, from the simple post-mortem alterations which, though often quite striking, only prove that certain tendencies, dangerous in themselves, are no longer restrained by an active vital force. In the wide range of pathological phenomena distinction must be made between those which, as being inevitable, are in a certain sense natural, and those produced by some mechanical, chemical, or toxic agency. Still farther, it is of the utmost importance to determine the relation which exists between the death that has occurred and any organic lesion which the eye may detect with or without microscopic aid. It sometimes happens that an autopsy, through its failure to discover anything wrong, may be unable to explain and justify the fact of death; and it is possible that dissolution now and then depends upon some invisible and inappreciable cause which is quite independent of marked and obvious changes that may be disclosed in the progress of a medical examination. However this may be, the lessons of the pathologist are not the sole reliance, and many a problem that cannot be solved by the rule of pathology is transformed into a comparatively easy question when brought into the presence of the chemist. When by the propriety or necessity of a particular case the medical examiner is admonished to invoke the aid of chemistry for the completion of a work that he is powerless to finish, the preliminary arrangements must include such preparation as will

best facilitate and render most efficient analytical search by suitable tests, and also such preservation, with sure means of identification, as will prevent any violation of the law of evidence from nullifying testimony that is intrinsically good. With this brief allusion I leave these points to be stated with due fullness and force by gentlemen who will command an authority that is accorded only to those who have made thorough studies of special subjects.

The collection of medico-legal facts is to be effected by a very simple and certain method. According to a schedule which is intended to touch all necessary points, every medical examiner within the jurisdiction of this organization is required to "forward to the corresponding secretary a report, as full and complete as possible, of each case which shall receive his official attention." Through its representatives the society will obtain contributions from almost the whole area of the State. The field is a large and tolerably rich one, but its fertility will depend upon the care and attention with which it is cultivated; upon the degree of thorough and appreciative observation which is bestowed upon the several cases. A summary of the products of the first culture, assorted and arranged by a careful hand, will soon be presented to you. It deserves some distinction as being the first attempt to embody in a single report those facts which make up the history of Massachusetts during a period of six months in all that pertains to deaths known or supposed to be from violence. It must contain material which is capable of being wrought into that more perfect and elaborate form which, in the higher sense of the term, constitutes an acquisition in science. The regular publication of facts thus secured and certified is a process of utilization for general purposes; but in a special way it will benefit the individual medical examiner by enabling him to appropriate for his own use something from the annual experience of the whole corps. It will make such addition to his knowledge as will render the vision keener while it enlarges its range, so that in each succeeding year observation will be more accurate and more prolific.

The average Massachusetts ear has rarely heard of forensic medicine; it is not a familiar designation. Although a necessary thing in the social fabric, it has had but a vague and ill-defined existence. Its importance has never been recognized among us with all the formality to which it is entitled. So far as I am aware its cultivation has never held for practical ends the prominent place among the avowed objects of any society that has been formed in the State. However, the department of health of the American Social Science Association is declared to be a "society for the study of sanitary science and medical jurisprudence." The efforts of this body in the latter direction, as the secretary informs me, have not extended beyond a movement which should be accredited to a gentleman whose ready assistance to-day bears

conclusive testimony to his friendship for the medical examiner. That movement aimed at the abolition of inquests as they were.

The province and power of forensic medicine once understood, the interest in it cannot fail to be widely spread. Of the community which finds a representative and an embodiment in each individual member, it is the safeguard. It appeals to the instinct of self-preservation in one of its forms. It furnishes the means of establishing the fact of crime committed against the person, no matter whether that crime be fatal, non-fatal, or, as in certain cases of fœticide, mixed. With the proof of offense it fixes the basis and starting-point of any procedure that proposes to detect the offender, the limits of whose accountability forensic medicine must define in accordance with those distinctions which originate in the difference between a sane mind and an unsound or defective one. In a double sense it is the instrument of right, and in the protection and advantage which it brings it cannot fall below the high place which, with so much enthusiasm, has been assigned to sanitary science as an efficient agent in the hands of philanthropy. Of the many subjects which come within the scope of forensic medicine, although some commend themselves only to medical men, there are others which ought to attract the intelligent thought of non-professional people and receive the benefit of its energy. The deep interest which physicians must take in this branch of their profession grows directly out of their tastes and aptitudes, the quality of their knowledge, and the nature of their occupation. It is their exclusive privilege to be the masters in forensic medicine. Therein they find one more opportunity for the exercise of high abilities and the application of varied attainments, as the requisites for success are a quick and thorough perception, a judicial mind, and a rich and mature experience. From it they derive the advantage of close relations with another form of liberal education. Within the medico-legal domain there is a point at which medicine and law come in contact; their work is that of coöperation; their interests, if not identical, lie along lines that converge to a common end. It is the point at which, on the one hand, scientific investigations are pursued under the protection and according to the forms of law, and, on the other, medical evidence determines the administration of law in consonance with the requirements of justice and of facts.

The time has arrived for calling into existence the forensic physician, properly trained and equipped, and invested with a due rank beside the surgeon, the accoucheur, the oculist, and the aurist. He will forthwith appear as one of the results of the successful cultivation of forensic medicine, which, as being in a certain sense a specialty, should not engross the entire attention of young men, nor should it repel and discourage those who have given their early years to ordinary practice. Specialism finds unfailing strength in general and generous culture; its

object is not to limit but to increase attainment; it was never intended to pervert the mental vision, nor to narrow and cramp the operations of the intellect.

A second result may possibly be found in an improvement in the present irregular, inconsistent, and unsatisfactory method of medical evidence. By the unanimous concession of all honorable men a radical change is needed. Attempts have been made in this direction,[1] but they have not succeeded because they were relatively premature and did not receive the sympathy of the prevailing sentiment. May we not now look for a new system, the details of which are yet to be arranged, through which we shall derive testimony which, as being scientific, shall be impartial, and as being based upon an enlightened experience shall be truly expert?

It is possible that another result may be expressed in some provision which our medical school may be induced to make for instruction in a department of medical knowledge which its present curriculum does not explicitly recognize. Some of the most important matters which are fundamental to this branch are thoroughly taught, but it still remains for a competent master to point out the relations between these elements and the principal subject, to supply that which other departments are not expected to furnish, and to teach forensic medicine as a whole.

In the dependence of its infancy this society will invigorate itself by contributions obtained from several sources, — from pathology, chemistry, the science of mental disease, and from statute law. In return for the assistance thus rendered it will preserve an unwavering fidelity to the purposes of its organization, and according to its power and its opportunity it will strive to do its full share in the endless work upon which human progress depends. For stability, power, and influence it looks largely to the members of the medical profession, who as medical examiners from its regular constituency or as medical men are in duty bound to extend to it both hands in fellowship. It is now ready to speak for itself in its first communications to the State society. And in explanation of an obvious quality which characterizes a part of them, we will simply remark that the novice can find a safe starting-point only among elementary things.

[1] See Boston Medical and Surgical Journal, vol. xc., page 387.

THE RELATION WHICH CHEMISTRY BEARS TO FORENSIC MEDICINE.

BY PROF. E. S. WOOD, M. D.,
Associate Member.

It will naturally be impossible, in the short space of twenty minutes allotted to this essay, to treat with any degree of thoroughness so extensive a subject. I shall therefore limit my remarks to a few practical points having reference to the relations between the medical chemist and the medical jurist or medical examiner, the importance of which my experience with toxicological cases in New England has shown me is either not generally appreciated or not always borne in mind.

The duty of the chemist in legal cases is, in the first place, to assist justice, and, in the second, if possible, to further the advancement of science; and in order to fulfill this duty his work must be most thoroughly done, which necessarily presupposes a proper and complete treatment of the case before it reaches his hands. The object of a chemical analysis, in toxicological cases at least, — and it is to these cases that I shall chiefly refer, — is to determine the cause of death, or to confirm the opinion already formed. If poison has been the cause of death, this should be determined by the shortest method consistent with accuracy; and to accomplish this the chemist should be possessed of all of the information which it is possible for the physician to give him. He should be not merely a chemist, but he should be a toxicologist, in the widest sense of the term. He should understand not only the physical and chemical properties of the poisons which he endeavors to detect, but also their action upon the human and animal economy, the symptoms which they produce, and the changes which they may cause in the various organs and tissues. With such knowledge he may, provided with the information which can be furnished only by the physician who had charge of the case before death, or the pathologist who conducted the examination of the body after death, often be enabled to eliminate certain classes of poisons, or to confine his attention to a single class only or even to a single poison. If he is thus informed the analysis may be completed much more quickly than otherwise, and the county saved considerable expense.

It only too frequently happens that a complete account of the post-

mortem appearances cannot be obtained, because the section has not been thoroughly performed. In a personal experience with four cases of poisoning by strychnia, three of which were cases of criminal poisoning, I have never known of the spinal cord being examined, a point which might prove of vital importance in a criminal trial; and in one of these cases, one which may still result in criminal proceedings, the intestines even were not examined, except perhaps their external surface. In two other cases in which the cause of death was an irritant poison, the intestines were delivered to me unopened, an omission which might result in the escape of a person guilty of murder.

Another important point in reference to enabling the chemist to perform his work properly is the collection of the suitable material for analysis both during life and after death. Most important of all is the saving of the vomitus and excreta in cases of suspected poisoning. There are numerous instances in which this precaution was almost the sole means of proving the cause of death. We all know that the irritant poisons are violent emetics, and frequently result in the complete emptying of the stomach, so that after death no poison can be found in that viscus. The most notable instance of this kind which I recall is that of Couty de la Pomerais, which was investigated by M. Tardieu in 1863, and in which a large amount of digitalin was obtained from scrapings from the floor on which the vomitus had fallen, while only traces could be detected in the stomach and intestines. Anything which has been stained by vomitus or excreta, such as clothing or bedding, may be of the greatest importance in a medico-legal case, and should never be thrown away or be washed, as is too frequently the case. In a case of digitalis poisoning of my own it appeared in evidence that the bedding and clothing were very much soiled by vomitus and intestinal discharges, yet it was not saved for examination. This was not, however, of great conseqence, since quite a large quantity of powdered digitalis was found in the stomach after death, a sufficient amount to enable me to detect it by the chemical, botanical, and physiological tests. It may happen, too, that the administration of emetics or the use of the stomach-pump may entirely remove the poison from the stomach, in which case the vomitus and excreta evacuated before death, and fluids withdrawn by the stomach-pump, would be the most important substances for analysis.

In some cases life may be prolonged for a sufficiently long time to permit of the complete elimination of the poison, and death result only from its secondary effects. This is especially apt to be so with phosphorus and some of the alkaloids, and in one case of arsenical poisoning, with which I was familiar, and in which the patient did not die for about a fortnight, there was only a minute amount of arsenic left in the organs. Hence another reason for saving the vomitus, if there is any, in cases of *suspected* poisoning.

For the same reasons the urine which is passed during life should be collected for chemical examination when poisoning is suspected. The kidneys being the chief eliminatory organs, the urine is apt to contain the poison for a long time after its ingestion. This is most liable to be of significance in the case of those poisons which do not prove fatal in a short time, such as arsenic, antimony, and some of the vegetable poisons; especially important is it in cases of chronic antimony poisoning, one of which has recently been on trial in New York. The urine is of value in such cases not only for the detection of the poison, but also for the ordinary clinical examination, which may show evidences of fatty degeneration of the kidney in cases of phosphorus, arsenic, and antimony poisoning, or of acute nephritis, which may be due to the action of many irritant poisons in passing through the kidney, such as mercury, cantharides, etc. I once had an opportunity of examining the urine in a case of poisoning caused by a medicinal dose of calomel; it presented all of the characteristics of acute nephritis.

The urine found in the bladder after death is also of great importance in many cases, since the detection of the poison in that fluid may settle the question, within certain limits, as to the time of its administration, — a question which is of such vital importance in many medico-legal cases. This is also of scientific interest in showing the time required for the complete elimination of a poison. For instance, it has been recently determined that arsenic *may* remain in the system for six and a half weeks, although fifteen to twenty days is usually considered sufficient for its complete separation from the body.

Suspicious substances, those which may have been the cause of the illness, found in the room or neighborhood of the patient or deceased should in legal or doubtful cases always be seized for testing; and this should always be done *at once*, when first seen by the physician, coroner, or medical examiner, and no time allowed to elapse so that they may be tampered with. The possession of such substances by the chemist will frequently show him, by a few simple tests, the nature of the poison probably present, and perhaps enable him to arrive at his results many days earlier than he otherwise could. Although this would seem to be the most natural thing for the medical officer to do, yet it is, so far as my experience goes, very rarely done. In a case which is still under investigation, I was not informed until after my analysis was nearly completed that the suspected person was possessed of oxalic acid and nux vomica; but, fortunately, the symptoms were known, so that the latter substance was sought for rather than any of the irritant poisons. In another case, however, crystals which proved to be those of oxalic acid were found in the pocket of a coat belonging to the deceased, and by searching directly for this substance, and using the entire amount of material at my command, I was enabled to detect

it, a result which probably could not have been attained had a large portion of the material been used up in an analysis for the other irritant poisons.

Again, I regret to be obliged to make the statement that it is rare for me to receive for analysis, in cases of suspected death from poison, any organs except the stomach, until the fact is mentioned that if the case should happen to result in a criminal trial, the detection of the poison in the stomach alone might be of no avail, since that would not prove with absolute certainty that it had not been introduced into the body after death; whereas its presence in other organs at a distance from the stomach would show that it must have been absorbed into the circulation and carried there during life, and also that death may have resulted from the action of a poison which has disappeared from the stomach and intestines, but may be found in the other viscera. Of the solid viscera the liver, as a rule, contains the largest amount of poison when the latter has been taken by the mouth, it being carried to that organ as soon as absorbed through the portal circulation; and in the case of many poisons, strychnia for example, it appears to enter into organic combination with the tissue or constituents of that viscus, and be retained, or heaped up in it, as it were. In some criminal cases, however, the objection may be raised, especially when a long time has elapsed since the death of the victim, that the poison may have reached the liver also after death by endosmosis through the wall of the stomach, and therefore the analysis of some of the other organs also is of value. For this reason the various organs should always be placed in different vessels, and never be allowed to lie in contact with each other.

It is of almost as much importance to save the brain for analysis as the liver. In the case of arsenic, for example, it has been recently shown that this poison is contained in the brain to a larger extent even than in the liver in cases of poisoning by it. It would surely be impossible to introduce arsenic or other poison into the cavity of the skull after death without the certainty of the detection of such an act.

Frequently, even when vomiting and purging have not occurred, all of the poison may have been removed from the stomach and intestines by absorption, and yet be capable of detection in the blood and solid viscera. Nicotina, for example, in the famous Count Bocarmé case, was detected in the liver and lungs; prussic acid has frequently been found in the blood, phosphorus in the liver; strychnia and nearly all of the mineral and vegetable poisons have been found in the blood, secretions, and solid viscera. The stomach, contents of the stomach, intestines, contents of the intestines, liver, brain, spleen and kidneys, and urine should be placed in separate jars for chemical analysis in all cases in which a chemical analysis is of importance. Except in criminal cases it will not be advisable, of course, to examine all of these

organs separately, on account of the length of time required and the expense incurred; but in many cases, when not needed for legal purposes, this material may be used for settling some points of scientific interest.

It is also of value to remember that the identity of all of these articles, after they have been properly removed, sealed, and labeled, must be preserved beyond any question whatever. This can be done only by keeping them under lock and key until they are dispatched by special messenger, or better messengers, and delivered in person to the analyst, who must in his turn keep them constantly under lock and key. In a recent criminal trial, a notorious criminal would have escaped from justice had the chemical evidence rested solely upon the detection of the poison in the stomach, which had been sent by express. The other organs, which also proved to contain the poison, were afterwards sent by special messenger, according to the direction of the analyst.

THE VALUE OF ANATOMICAL APPEARANCES.

BY PROF. R. H. FITZ, M. D.,
Associate Member.

THE object of the present paper is to refer very briefly to some of the general points to be borne in mind in making an autopsy, and to consider the group of changes found in a very common form of death, — that from suffocation.

In the medico-legal examination of the dead body, the end sought for is a knowledge of the condition of the various organs of the body, that an opinion may be formed as to the cause of death.

The evidence offered is physical, relating to form, density, color, etc., and its appreciation necessarily implies a familiarity with the physical properties normal to the part in question.

The first stumbling-block is here met with, and often proves a serious one. The obstacle becomes the greater from the fact that even normal conditions may be materially modified by the presence of alterations resulting from a series of processes, — chemical and other, — which are generally grouped together under the head of post-mortem changes. How important these are is often seen in the difficulty of distinguishing between a hypostatic patch and the discoloration due to a bruise, upon which distinction is to depend our opinion as to the ante- or post-mortem origin of an injury. Similar doubts also arise in the examination of the internal organs, and whether a redness is the sign of an inflammation, or an opacity the result of a degeneration, often becomes a matter of vital importance.

It is not only the normal properties of organs and tissues which may be thus modified, but serious pathological changes may also become obscured. I need only refer to the difficulty of deciding whether a heart or a kidney has been the seat of a granular or fatty degeneration occurring during life, or whether the observed characteristics may not be wholly due to post-mortem alterations. A study, therefore, of the latter is as essential as is the knowledge of morbid appearances.

Even when the examiner is perfectly familiar with normal and diseased appearances, as well as with those resulting from post-mortem processes, the results of his investigation may lose in value from his method of statement. It is the general tendency all the world over for the reporter to record his opinion and not his observation. In writing

a description of the alterations found, the utmost possible attention should be paid to objective appearances. A dead body is an object of nature, one of an extremely composite character. It has been and is the seat of a great number of processes, some of which may have been the cause of death, while others represent a result of this condition. Those which have preceded death may have no very intimate connection with the same, and yet may produce a decided influence on the mind of the examiner from his knowledge of their sometime clinical importance. As the opportunities of most observers are mainly clinical, the tendency is a direct one to substitute clinical for anatomical and descriptive terms.

In a report of the examination of the dead body of a new-born child it is stated that the face was apoplectic in appearance. Such a description presents an opinion or judgment which is based upon several factors. Apoplexy has a symptomatic meaning, referring to being struck down, whence the common term apoplectic stroke. Since in many, though by no means in all, of these strokes intracranial hæmorrhages have been found, and were recognized as holding a causal relation to the result, the primary symptomatic significance of the word received a new meaning, and it became used as synonymous with hæmorrhage. As the stroke was found to occur without intracranial hæmorrhage, the congestive and serous apoplexies were formulated, whose value was largely clinical. From the predominant hæmorrhagic element in the first series, the pulmonary, splenic, and renal apoplexies were introduced to designate appearances resulting from the presence of abundant blood, although apoplectic symptoms were not connected. The clinical apoplexy was often associated with a flushed face, short neck, abundant fat tissue, stertorous breathing, loss of consciousness, and paralysis. Some of these conditions were thought to indicate the apoplectic habit or temperament, the possessor of which was liable to the stroke. The flushed face, as in the case of the infant referred to, has evidently been employed descriptively. A livid face, as we all know, indicates merely a disturbance in the circulation through the blood-vessels of the face, and may occur quite independently of any intracranial hæmorrhage, or hæmorrhage elsewhere. There is, therefore, strictly speaking, no apoplectic appearance of the face, and the livid hue may be due to numerous causes, particularly those interfering with the return of venous blood to the heart.

Another term which is much abused in the records of post-mortem examinations is inflammation. This is very often used in a purely descriptive sense. Inflammation of the lung, or intestine, or kidney, is stated as a matter of fact, whereas in reality an opinion is herewith expressed founded upon a number of facts. Inflammation, as we all know, represents a process, better still a sum of processes, which pre-

sents different appearances according to the stage, duration, organ affected, cause, etc. External inflammations have as very common factors redness and swelling. These are readily transferred as the essential features in describing the condition of the internal organs. But redness and swelling may both be present without any inflammation. The frequent inflammation of the intestine often owes its existence in the records to the presence of blood and fluid in the walls of the intestine, especially within the mucous membrane. Both these appearances often occur here, as elsewhere, as purely post-mortem phenomena. They may result from gravitation, from the distribution of the intestinal gases and other contents, in consequence of which blood is forced from those coils of intestine which are distended with gas, and accumulates in the portions of the tract from which the gas has escaped. To justify the opinion that there is inflammation, therefore, other facts are necessary, and would be present were the results of inflammation actually met with. After death there is no inflammation. That it may exist, vital processes in the organs and tissues of the body are necessary, and the anatomist seeks for the evidence which these processes have left behind in such parts.

Still another misused term may also be mentioned in this connection. The redness of an external inflamed part is called congestion, and as this is due to an increased quantity of blood in the part, the same term has been employed to represent that condition in general. As this increased quantity of blood has attracted attention chiefly from its clinical importance, the active and passive congestions have been discriminated, — those due to a flux of blood and those due to a prevented escape of blood. After death organs are often found to contain an increased quantity of blood, and the term congestion is commonly applied to this condition. The qualifications, active and passive, are no longer applicable in the same sense that they were during life. Then they represented nerve force, cell activity, muscular irritability, and mechanical influences of various sorts. Now most of these have ceased, though mechanical influences may still be present, and are of great importance in determining the post-mortem distribution of blood.

The appearance is primarily that of color, which is due to the presence of blood coloring matter properly within the vessels.

This distinction, however, is not always borne in mind, for one reads of a congestion of the aorta, referring merely to a diffused, dirty-red color of the inner surface of the artery. The nutrient vessels of this trunk are not sufficiently large to be visible to the naked eye ; the color therefore might still be considered as due to blood within them. Microscopic examination shows that such is not the case, but that the color is due to a uniform staining of the tissues of the wall with blood coloring matter which has escaped from the corpuscles. From the limita-

tion of the color, its position, and the association with other changes it is evident that this congestion merely indicates the post-mortem decomposition of the red blood-corpuscles and the escape of their coloring matter into the surrounding parts.

Where observers are still more exact in their use of language they apply the term congestion to the presence of blood within vessels visible to the naked eye. But as congestion is generally of clinical significance, and is dangerously suggestive of inflammation, it would be preferable to eliminate it from post-mortem terminology and substitute the word injection. Herewith we have purely the result of a physical process, which may occur after death as well as during life, the causes, however, being widely different. Some of them — as gravitation and the effect of intestinal gases — have already been alluded to. Others may be mentioned which also give evidence that a circulation of blood may take place after death. A recognition of this possibility becomes of exceeding importance in determining the origin of certain peculiar appearances which are not rarely confounded with those resulting from disease.

It is very well known that after death the arteries are usually found comparatively empty, while the veins contain a considerable quantity of blood. This differing relation is generally attributed to the post-mortem contraction of the thick muscular coat of the arteries, which serves to push the blood along in the course of the circulation, that is, towards the veins. This represents, however, merely one step in the process. The relatively empty arteries are commonly the larger ones, while in the smaller arteries, as those at the base of the brain, a considerable quantity of blood may be present, and can even be withdrawn in the form of a clot. When this clotting has actually taken place the opportunities for a post-mortem arterial circulation are no longer favorable. Any contraction of the wall now serves merely to squeeze from the moist clot its liquid contents, which may either be pushed along or soak through the arterial wall into the surrounding tissues. On the venous side, however, the blood is largely fluid, particularly that within the smaller veins. It is therefore capable of being urged on not merely by the arterial *vis a tergo*, but also by the rigidity taking place within the voluntary muscles. Through their post-mortem action and the presence of valves the blood tends to flow from the extremities towards the heart, this tendency being favored by the presence of causes opposing rapid decomposition. The passage of blood towards the heart is still further promoted by the development of gas within the intestine. The more abundantly this forms the greater is the intra-abdominal tension, and the movable contents of the abdominal canals seek to escape through their outlets. The contents of the stomach are found in the mouth, those of the rectum and bladder at the external openings of

these viscera, while the transmission of pressure through the walls of the inferior vena cava causes the inclosed blood to be pushed upwards into the heart. This blood may be movable, even if clotted, and the presence of homogeneous, soft, dark, curved, and laminated clots in the right auricle thus meets with the most ready explanation.

After the examiner has made a thorough and accurate study of the body the opportunity is presented for the formation of an opinion as to the cause of death. That this may be ascertained it is often necessary to obtain additional information with reference to the symptoms which preceded death, that is of the manner of dying. When severe injuries have been inflicted it is customary to attribute death to these. Yet we all know that injuries of the same apparent severity are by no means of equal gravity. Although we may be unable to determine why death should have taken place in any given instance, we are always called upon to seek for evidence of the manner of dying, and not unfrequently from the anatomical and histological appearances an opinion may be formed of considerable relative value.

It is the general custom, not only for the forensic but for most physicians, to use certain formulæ which nominally express the cause of death, though in reality merely stating its existence. It is said to result from violence in consequence of certain injuries, or is caused by paralysis of the heart and lungs, in the absence of any evident injury. It may be due to inflammation, congestion, anæmia, or blood-poisoning. Death is assumed to result from a failure in the action of the brain, lungs, or heart, that is from coma, asphyxia, or syncope ; and the question therefore naturally arises, Can we determine from evidence found after death whether this statement contains a certain amount of truth ?

We are told that in death from syncope the heart is supplied with an insufficient quantity of blood, and consequently its action ceases. The anatomical appearances are said to be a normal proportion of blood in the two sides of the heart, and the presence of blood in the arterial and large venous trunks.

In death from asphyxia, on the contrary, defective blood is furnished to the various organs of the body in consequence of an obstruction to the entrance of air into the lungs. The appearances described as characteristic of this form of death are an engorgement of the right side of the heart, and of its feeding and distributing vessels, with an empty condition of the vessels and cavities carrying arterial blood. In certain cases of asphyxia, however, the cavities are said to have been found empty, and the term syncopal-asphyxia is offered to express this condition. The indications of death by the brain are to be found in a congested condition of the brain and its membranes.

This time-honored classification of the causes of death may be considered as having little more than a clinical significance. The terms are

indicative of symptoms, for in syncope the person is cut down as in apoplexy; in asphyxia he is pulseless; and when comatose he is profoundly asleep. All of these conditions may occur more or less suddenly, and may last for a longer or shorter time. What is of especial importance at present is the general absence of anatomical evidence characteristic of the sole existence of the one or the other of these conditions during life. Pathological changes in the brain, either acute or chronic in character, may undoubtedly give rise to a paralysis of respiration and circulation, and it is by no means easy to obtain evidence as to which of these processes was the first, or which the most affected. The eventual result is the same: the production of such changes in the composition of the blood that it is no longer properly aerated and decarbonized. Disturbances in the functions of various organs of the body result, difficult breathing being a prominent symptom, and death is to be regarded as due to suffocation. The popular idea of the meaning of this term is limited to an obstruction of the air passages by foreign bodies acting from without or from within. Suffocation, however, is rather a condition composed of a group of symptoms, due most probably to an accumulation of carbonic acid in the blood and a diminution in the quantity of oxygen. It may result from causes preventing the admission of atmospheric air into the lungs, from those hindering the free circulation of blood in the lungs, and from those rapidly withdrawing oxygen from the blood.

In the first and last series are to be found the causes which are particularly important to the medical examiner, as they include cases of death from violence, injury, and certain poisons.

Writers on medical jurisprudence differ considerably in their statements as to the value of anatomical evidence in determining suffocative death. Most pathologists, however, would probably agree that the group of appearances to be met with is sufficient to establish the diagnosis in the majority of cases. The single appearances may be very considerably modified by the length of time during which death was taking place, the condition of the person at the time of impending death, and that of the air passages at the moment of death. They all relate to the condition of the blood and to that of certain organs in consequence of its altered composition.

A dark color and fluidity are the two most striking characteristics of the blood in cases of suffocation, and have long attracted attention. The former is of apparent value rather than of real importance, as all blood is dark after death, unless its coloring matter has been previously modified by certain substances, notably carbonic oxide gas. The dark color is particularly noticed at the autopsy, in consequence of the usual increased quantity of blood found in the right heart, and its fluid condition.

When death occurs under other circumstances and the blood clots, a

gravitation of the red blood-corpuscles generally takes place, and the light and dark portions of the clot are differentiated. The lighter portion of such a clot may so predominate under various conditions that, in extreme cases, as in leucæmia, the blood may bear a resemblance to pus.

The dark color is not therefore to be regarded as due to any vital conditions, impregnation with carbonic acid gas, or deficiency of oxygen previous to death, but merely as a characteristic of the blood of dead persons in general.

The fluidity of the blood is of far greater consequence as a sign of death from suffocation, and is very constantly observed in the right side of the heart and in the vessels connected with it. We have but little positive knowledge as to the cause of the fluid condition in these cases, nor can we regard the appearance as of absolute value. Liquid blood may be present when death has not been the result of suffocation, and in undoubted cases of death from suffocation the blood has been found clotted. An important element in the origin of the latter exception to the rule seems to lie in the length of time between the action of the suffocating cause and the event of death. In gradual death from suffocation the right auricle and ventricle may contain clotted blood; so that the presence of such blood is not opposed to the theory of suffocative death.

Another important condition very commonly met with is the distention of the right side of the heart and its communicating vessels. The immediate cause of this distention is generally considered to be a paralysis of the right side of the heart and the consequent accumulation of blood. It is to be remembered, however, that death from suffocation may take place without any decided distention of the vascular territory referred to, as when anæmic persons die from suffocation. It seems further not unlikely that the heart may contain less blood in those cases where it continues to beat after the action of the respiratory muscle has ceased. The accumulation of blood in the venous canals, including the pulmonary artery, is a direct result of the distention of the right side of the heart. The coronary veins often project as prominent, rounded cords, the pulmonary artery and its branches are dilated, and the lungs themselves frequently appear gorged with blood from the filling of the smaller vessels within these organs.

This venous engorgement of the lungs, though perhaps occurring in the majority of cases, is still by no means a constant appearance. When present its origin is most probably due to violent inspiratory efforts, which, if accompanied with a closure of the air-passages, necessitate an aspiration of venous blood into the thorax, and its entrance into the lungs, supposing the heart to be at work. It is therefore apparent that the engorgement of the lungs is more likely to occur when death imme-

diately follows a closure of the air passages, and especially when the closure takes place towards the end of expiration, at which time there is comparatively little air in the lungs and more room for blood.

If, however, the cause of suffocation is an embolism of the pulmonary artery, the entrance of venous blood is prevented, while air is allowed free admission. In such cases of suffocative death the lungs may even be anæmic. So when the suffocation is connected with œdema of the lungs or with the free admission of water through the bronchi, as in death from drowning, a less quantity of blood would necessarily be present than when the blood-vessels were more capable of distention.

Other appearances met with in the air passages present a relative value: these are the injection of the vessels of the larynx, trachea, and bronchi, emphysema, sub-pleural ecchymoses, and the form of the epiglottis.

The injection of the blood-vessels is evidently largely due to the same causes which produce the venous engorgement of the lungs, and requires no further consideration. The sort of emphysema which is of especial value is the interstitial variety, where air bubbles are present within the connective tissue of the lungs, the walls of the air passages having been ruptured by the violent respiratory efforts. Groups of alveoli may also be widely distended, and then appear somewhat prominently when the surface of the lung is examined. The latter condition may be present when death is occasioned in other ways than by suffocation; the former is very commonly absent; and both must not be confounded with the presence of gas in consequence of putrefactive changes. The ecchymoses have attracted great interest, and have generally been attributed to extreme pressure within the walls of the smaller vessels, consequent rupture, and resulting minute hæmorrhages. Of late years stress has been laid upon their origin, in part at least, through vaso-motor disturbances, spasmodic contraction of certain vessels, and collateral hyperæmia of others. As is well known, these ecchymoses may be found not only beneath the pleura, but also in the pericardium, tracheal and gastric mucous membranes, and more rarely in the peritonæum and elsewhere. It has been supposed that they were the result of suffocative death from violence, a view at present to be regarded as obsolete, from the accumulated evidence in opposition. It may also be said of these ecchymoses that when present they are of value; when absent, death from suffocation may still have taken place. Even when present they merely represent a state, minute hæmorrhages, which may arise in consequence of injuries, or of various diseased conditions attended with an abnormal relation of the vascular walls to their contents.

It is stated by Orth that in all forms of death from suffocation the epiglottis undergoes a constant change in form, manifested by an ap-

proximation of its edges, giving rise to a wedge-shaped appearance. I find no mention of this peculiarity in the most recent works on medical jurisprudence, and have no personal experience which permits me to form an opinion as to the value of this sign.

Additional evidence of death from suffocation is to be found in the venous engorgement of the brain, liver, and kidneys, one or more of which organs very generally present appearances indicative of the presence of an unusually large quantity of blood. The conditions which prevent an emptying of the right heart tend to cause an accumulation of blood in these organs. The importance of the recognition of the degree of injection of the vessels of the brain in all cases is apparent, and the desirability of examining the brain before the thorax and abdomen are opened is well recognized. In general, when death results from suffocation a bluish marbling of the brain and unusually prominent and abundant *puncta cruenta* are appearances to be sought for. They are sometimes wanting, however, and their absence does not exclude the possibility in question. An œdematous brain may be present in cases of suffocative death, and is usually associated with a diminished vascular injection. It has been demonstrated experimentally that an actual anæmia of the vessels of the pia mater may immediately precede death from suffocation, and observation with the ophthalmoscope has shown diminished contents of the retinal vessels during the dyspnœa antecedent to death.

Finally, the injection of the liver and kidneys remains as one of the constant appearances, and is essentially due to the engorgement of the right side of the heart. The injection of the kidney is perhaps the more striking as but little blood oozes from this organ during its examination. From the liver, on the contrary, a considerable quantity escapes through the cut inferior vena cava before the organ is removed, supposing the usual method of examination to take place.

In conclusion, brief mention may be made of certain external appearances which have attracted more or less attention, but which are to be regarded as of wholly secondary importance. First among these is the livid hue of the skin, especially that of the face, though prominent elsewhere as unusually large and numerous hypostatic spots. Ecchymoses are also occasionally met with, and stress has been laid upon the protrusion of the eyeballs. These modifications in the distribution of the blood are subject to so many variations, including entire absence, that but little weight can be attached to them. When present they are apt to be associated with diffuse staining from early putrefaction, which becomes more extensive when the general conditions favoring rapid putrefaction are present, as warmth, moisture, free access of air, and the existence of some infective disease. The accumulation of much blood at the surface of the body and the occurrence of suffocation in

many relatively healthy individuals, especially full-blooded ones, are the important causal factors explanatory of early putrefactive changes in these cases of suffocative death.

The position of the tongue, between or behind the teeth, is of comparatively little consequence, owing to the irregularity of its presence between the teeth in death from suffocation, and to the fact that this position is assumed when death is the result of other conditions.

Another appearance frequently mentioned is the presence of a scum or froth over the mouth or nostrils. This is evidently due to the escape from these openings of a more or less viscid fluid, in which numerous bubbles of air are contained. As the fluid portion evaporates, a crust is left adherent to the skin. This appearance is often seen in cases of death from drowning, though also met with when death results from natural causes, and is most commonly observed during warm weather. It merely indicates that mixed fluid and air or gas are escaping from natural canals of the body, the escape being promoted by putrefaction of the abdominal contents, particularly of those in the intestine. This froth may proceed from the lungs or stomach, or from both. In death from drowning the trachea and bronchi contain a considerable quantity of air and water, the latter readily becoming viscid from its admixture with mucus or albumen. As drowning most commonly takes place in summer, when the temperature favors early putrefaction, the contents of the lungs are forced out by the abdominal distention. In death associated with œdema of the lungs the same phenomenon may be observed.

The contents of the stomach, likewise, if fermenting or putrefying with the abundant formation of gas, may escape outwards through the œsophagus, — in part from the intestinal pressure, in part from the volatility of the gases produced. The recognition of this possibility of the escape of the contents of the stomach after death is of considerable importance, as it is possible for a portion of them to enter the lungs from above, and there give rise to changes which have been mistaken for diseased conditions. Further, when the group of appearances suggests death from suffocation, the finding of particles of food in the air passages might be considered as giving evidence of the production of suffocation through the inhalation of the contents of the stomach. In the post-mortem process the food is usually in a state of very fine division, whereas coarser particles are apt to be found when the inhalation has taken place under other circumstances.

It is evident, therefore, from the previous consideration that there is no absolutely characteristic appearance in death from suffocation, but that the group of appearances mentioned offer strong presumptive evidence. Dark liquid blood; vascular engorgement of the right side of the heart, the lungs, liver, kidneys, and brain; injection, even extrava-

sations, of the mucous membrane of the larger air passages; sub-pleural and sub-pericardial ecchymoses, with perhaps the wedge-shaped appearance of the epiglottis, form the series of changes, most of which will be found. The more sudden the death from suffocation, the more distinct are these appearances.

The diagnosis of death from suffocation being made, it remains for the examiner to bear in mind the three groups of causes, and his attention can then readily be directed to that which is of especial consequence in the determination of death from violence. The causes of suffocation important in this connection are those whose action prevents the admission of atmospheric air into the lungs. These may evidently act from without, as in cases of compression of the trachea or thoracic walls, and from closure of the mouth and nostrils; or from within, as in drowning or the admission of foreign bodies. The suffocation resulting from violence may also occur when serious injuries have been inflicted either upon the thoracic walls, as perforating wounds, or upon the nervous centres, as in cerebral injury.

The presence of additional evidence leads to the prime cause, and this evidence necessarily varies according to the nature of the case.

CONCERNING CORONERS AND THE THEORY AND PRACTICE OF INQUESTS.

BY THEODORE H. TYNDALE, ESQ.,
Associate Member.

Mr. President and Gentlemen, — Foremost among the objects for which a state is formed is the security of life. Without now taking the time to dwell further on the topic, it is enough to say in general terms that all human civilization and all progress, material and spiritual, were impossible without the firm assurance of this security. To maintain this assurance in its integrity is therefore of supreme importance to the state, and in endeavoring to do this it will exert all rightful means to prevent acts which tend to weaken the public sense of safety, and will seek promptly and certainly to inflict punishment for them, to the end that they may not occur again.

There are in all communities persons whom nothing but fear will deter from wrong-doing. Such persons, having no other power to restrain them, must be taught to feel the force of the law of cause and effect, must be taught to understand that the violation of a law is invariably followed by punishment as its logical and natural result, just as the seed brings forth the fruit; and to this end nothing is more effectual than *swiftness* and *certainty*. Minds that are incapable of taking in the theoretical statement will nevertheless unfailingly understand its force when practically demonstrated. To such you must bring home the conviction of inexorable and undeviating law, *swiftly* and *surely* applied.

How most effectually to reach this end, how best to attain this swiftness and certainty, this is the question which must settle all methods and detail for us. Be a system or tradition never so dear to this individual or to that nation, if they do not tend to establish this precision of result they are useless, and must give place to that which will. To this question all preconceived notions and pet ideas must yield. If they do not bear this test they have no right to prevail.

The special subject before us is the discovery of the cause of a death where the cause is unknown, and there is suspicion of wrong-doing. What is the purpose of the discovery, and how is the proceeding conducted? The answer to the first question is the *theory*, that to the second is the *practice*, of inquests.

What object is sought for in investigating the cause of a death? Why should the state wish to ascertain it? Why not bury the body and be done with it? Because a crime may have been committed, and the life of the state depends on its suppression of crime. Because to let one death go by unnoticed is directly to bid for concealment of crime, and to publish to the wrong-doer that he may with impunity kill his enemy, if only he take care that no one shall see him, and that the body shall be found without indication as to who perpetrated the deed.

With a private death, a death by natural means, the state does not concern itself. But a death becomes a matter of public concern the moment it is suspected that another's act caused or contributed to it. For the state cannot suffer a death by the act of another to be treated as a private injury, and to be privately adjusted, lest punishment take on the form of revenge, and beneficent protection become perverted to prejudiced persecution; lest heat and haste endanger justice, and passion subvert judgment. The moment, therefore, that a crime is thought to have been committed, the state interposes its calm and impartial hand; if it be a crime, the individual injury is merged in the danger to the common safety; if it be not, the individual is shielded from wrongful oppression. It has ceased to be a private matter between victim and accused, and has become a state affair. These considerations lead us to the answer: —

THE PURPOSE OF AN INQUEST IS THE DETECTION OF CRIME.

Incidentally it effects other ends as well, such as the exculpation of the innocent accused, the reassuring of the public mind, etc., but all such results, however important in themselves, necessarily flow from and are merely incident to the single purpose, *to detect crime.*

The word inquest or inquisition has been variously used to express both the entire proceeding by which the result was arrived at, and that result itself. Thus, for instance, an inquest was held and an inquisition (or verdict) was returned by the jury formerly, and there are instances in the English law of prisoners being tried upon the "inquisition," the "inquisition" being traversed and quashed.

The inquest now, however, is the inquiry. Formerly, you know, it was conducted by a coroner, and was known as a "coroner's inquest." This official originally had diverse functions, which in process of time have partly become obsolete, but in greater part have one by one been transferred to other officers specially created for the performance of such duty, and better adapted to the increasing multiplicity and complexity of the needs of advancing society.

He was a crown-officer, a sort of ministerial deputy of the crown. To deny his worth and usefulness in his day and generation were to ignore history, and to be forgetful of the laws of our own growth. For

a period when a revenue officer, the head of a bureau of standard weights and measures, a conservator of the peace, prosecutor of crimes, and sheriff's lieutenant could all be combined in one person, he sufficed. As such indeed he was an official entrusted with large discretion and great powers; and his office was a dignity and an honor, which no one would disgrace by receiving pay for it, and which none but lawful and discreet knights could hold.

But long since these functions, one by one, have grown too important in themselves, and too unwieldy, to be united with others; one by one they slipped from the hands of the coroner until but two were left him: first, the inquiring into the cause and manner of supposed deaths by violence, and, second, in certain contingencies the assumption of the office of sheriff.

These he continued to administer for some hundreds of years. But the actual work of these even was, ages ago, transferred to other hands. So far as any result flowed from it, the first steps of an investigation of a supposed crime have for a long period been performed by courts, and sheriffs have long had their regular deputies. The work of actual value, therefore, and that to which any weight attached, had all passed into other hands. Though the coroner continued to go through with certain formalities and proceedings, they were, and where they still exist are, wholly without meaning or value. Not the slightest attention is paid to his work, and not the least consequences attach to its results. So far as such work is of importance it is done over again by other offices and officers.

Useless it had long been, then; and had it been likewise harmless it might have gone on in peaceful imbecility for other hundreds of years. But bad and dishonorable men gradually got into the anciently honored office; corruption and abuses flourished in it openly. On the healthful symmetry of legal systems designed for beneficent ends this was an excrescence, and became a festering sore. It brought reproach and contempt on important portions of the administration of the law, and distrust and ridicule upon solemn trusts, until at last further forbearance would have been criminal.

Turning afresh to the source, and looking purely at the actual wants of the case, the State of Massachusetts, last year, abolished this worn-out office; and this it did in order that right conditions might again hold sway, and that an orderly system might take its place. The latter is now a logical part of the administration of the criminal law.

When now I say to you, "The coroner is dead, long live the medical examiner," it is not to convey to your minds any implication such as inhered in the proclamation, "The king is dead, long live the king." That was a tribute to the fiction of continuity in the head of the government. It is not my intention to convey to your minds any implication of successorship.

True, the coroner is dead, but you are not his successors. He has no successor. The line is extinct, and the race a memory. You are a *substitute* for him.

The coroner united within himself the duties of medical examiner and judge, and it was in this incompatibility of functions that the danger of the old system in our time lay. If now it be difficult, in the vastness of modern research, to be familiar and skilled in all branches of your profession, if it be more than mortal man can compass to know all the science of the law, how then can it be possible that one man should be versed in both, and so well versed as to be expert witness in one, and judge in the other?

You know, too, that the qualities of mind called into exercise in the practice of the two professions are not only different and distinct, but indeed diametrically opposed to each other. "Science is armed with a microscope, justice is blind;" the scientific investigator himself seeks his facts, and testifies to them. A judge never comes in personal contact with facts, but receives them from others, and holds the balance between them. Who can undertake to do both, — to be interested in the one and remain impartial in the other?

It was to get rid of this ill-assorted marriage that the new inquest law of Massachusetts abolished the office as theretofore existing, and, distributing its functions in strict accordance with the requirement of the duties to be performed, created the medical examiner for the performance of one duty, and transferred the other duty to the judges of the courts, leaving to each only that which is properly his function; the medical work exclusively to the medical examiner, and the legal work exclusively to the judges. There is here no community or confusion of duties; the line is sharp and clear.

Returning now to our starting-point, let us follow this line together.

THE SOLE PURPOSE OF AN INQUEST IS THE DETECTION OF CRIME.

That being its object, what is the process of conducting it?

A body is found dead under circumstances indicating that violence may have caused the death. The whole question to be determined is, Has a crime been committed? This question resolves itself into two others: First, Has the death been caused by violence? and second, Does that violence constitute a crime? The solution of the one is your business, the answering of the other is the business of the courts. The first is determined by a physical examination, the second by hearing sworn testimony to the facts, and applying the law to them. *Is there violence?* that is the medical question; *Is it criminal?* that is the legal question.

When a dead body is found, not infrequently it will happen that there is in the first instance no suspicion of violence. It will happen

that the cause is wholly unknown; that the persons who find the body know nothing more than that here is a body found dead, or that they have seen some one suddenly die, but the cause they neither know nor have any ground to suspect. It is this class of cases that gives rise to one of the questions I wish to discuss with you. They will often be found not to require an inquest, and such cases are finished with the view.

But since violence *may* have caused the death in any such case, and since the persons, often ignorant, that find the body naturally turn to an authorized official to report the case, and considering the paramount importance attached by the State to everything that concerns human life, the view should always be held and never declined. No death, the reason of which is not clearly known, should be permitted to pass unnoticed, or the reason of it left to inference. Some responsible and competent person should in every case satisfy himself that the death is not a subject for further inquiry. Neither should the examiner ever be content to decline to see a body because the story told him seems to make it clear that it is a death by natural means. The State has entrusted to his judgment an important step in its most important interests, and to decline to exercise his own faculties, and to make up his judgment on unverified hearsay, would be to be faithless to his trust, and to betray the grave charge committed to him.

You cannot expect to be free from insufficient understanding and misconstruction of the law by others. While, therefore, you will often find that the death was not violent, but natural, it is nevertheless imperative that the view should be held.

As before stated, the question, Was the death caused by violence? is answered by a physical examination. Incidentally, however, some "personal inquiry," as the law terms it, will frequently greatly assist you in answering this question. Information as to previous condition, surroundings, habits, circumstances under which the deceased was last seen, will materially assist the medical examiner in his investigation.

For instance, a body is found on the seashore. The examiner learns this fact from bystanders or neighbors. The body is dressed in ordinary sailor costume. A storm has recently been raging along the coast, and portions of wrecks are cast upon the beach. The man is a stranger, whose face is not known in the neighborhood; there are no marks or tracks in the sands indicating that the body was brought there by others. These external facts being ascertained by inquiry, the medical examiner will have little question that this was a death by the perils of the sea. He is, therefore, also to seek by inquiry to gain such information as will enable him correctly to reach a conclusion. But he must be careful to use such information only to assist him in answering *his* question, "Was the death violent?" and on no account

to go beyond this limit and attempt to determine who was guilty of the violence, whether it was criminal violence, or what degree of crime it amounts to. With this qualification, if the appearance of marks, or wounds, or the indications of the body point to the conclusion in his mind, as a scientific expert, that the violence was self-inflicted, he is unquestionably bound to state that fact carefully. This, however, will be seen to be not an exception but rather a confirmation of the rule above laid down, that the examiner is not to go into the inquiry, Was the violence criminal? suicide not being punishable as a crime. In death by hanging, certain indications assist the determination of the question whether the deceased was hung after death or during his life. The abrasions or ecchymoses may often indicate by their location whether the suspension was by the victim's own hands. In cases of death by incised wounds, the direction, and in the case of feeble persons the force, of the cut or blow may point clearly to self-infliction. In cases of death by poison, certain appearances about the mouth may assist in establishing whether it was administered by the deceased. In these and a thousand similar cases it is unquestionably the duty of the medical examiner to give his opinion, as a scientific inference, whether the body indicates death by suicide or not; but this so far only as it is indicated by the visible facts, or the well-authenticated scientific deductions from these.

Who did it, if another, and under what circumstances or what provocation? these questions the medical examiner must carefully abstain from considering. They are not his province, and indeed *he has not the means of solving them.* They are to be answered by the sworn testimony of others to facts not in themselves apparent. As he cannot even administer an oath to a witness, how can he hear sworn testimony? What he has not the means of ascertaining, how can he determine?

It being the purpose of an inquest to detect crime, in order that the criminal may be punished, it follows that where no one is to be punished no inquest is necessary. Unless, therefore, another's act may have caused or contributed to the death, there is no occasion to hold an inquest. Violence may take place without human coöperation. Deaths by drowning or falling are violent, but if they do not involve the act of another, it is perfectly apparent that such deaths are not violent within the meaning of the law. An inquiry designed only to aid in the detection and punishment of crime is needless where no crime has been committed. And if another's act did not contribute to the death, there was no crime, and there is consequently nobody to punish. It is clear, therefore, that the violence contemplated by the inquest law is *violence caused or contributed to by another.* Although not usually involving the act of another, it is nevertheless necessary always to submit cases of suicide to inquest, because on the one hand the physical indi-

cations may not be alone sufficient to place the fact of suicide beyond a doubt, and because on the other, even in cases of undoubted self-destruction, another's criminal act may have incited to it, and as this involves the hearing of evidence it must of course go to the court. The purpose of the inquest in such cases will be to discover whether another's act contributed to the self-inflicted violence. In all respects, therefore, the violence contemplated by the theory and the law of inquests is *violence caused or contributed to by another.* Violence in this sense, however, is not necessarily physical force applied to the victim. The leaving exposed of dangerous substances or weapons, counseling another to commit suicide, the administering of poison, yes, even acts of mere omission, such as failing to let a child or feeble person receive sufficient nourishment, building a structure so recklessly as to endanger life, — all these are, or may be, acts of violence in the contemplation of the law. The first thing required by the law is that the medical examiner shall *take charge* of the body, and this in order, first, that its examination may furnish all the evidence to be obtained from itself, its appearances and indications ; and, second, that it may not by any possible chance be tampered with, and the evidence of crime concealed or destroyed. To *take* and *keep* charge of the body is therefore of the highest importance to attain the ends of justice. That this will not always be acceptable to friends and relatives, and will sometimes be vehemently objected to, is a matter of course, and of no importance. The State's business must override the preference of individuals. The interest being important enough for the State to make it its own, all private interests must yield.

Objection may also be made that to take charge of the body will be unnecessary in many cases, as of evident accident not involving another's act, and where there are friends of the deceased at hand. The answer to this is that such cases end with the view, and the medical examiner has then no further *charge.* In all cases that do go further than a view, they do so because a crime may have been committed, and it is of the greatest consequence to retain charge, as before stated. Under the law the inquiry is to be into the *cause and manner* of the death. It is not enough to state in the report the immediate proximate *cause* of death, and nothing more, as, when a man bleeds to death from a cut, to say that he died of hæmorrhage, without the addition of the likewise medical fact that the hæmorrhage was from an incised wound, that the wound was made by a knife or edged tool, if that fact can be ascertained, and that the indications (if such be the case) point to its self-infliction or otherwise. Cause is one thing, *manner* another, and the object of the law, as well as its language, requires both to be ascertained and reported.

With the remaining question, if violence is found to have been com-

mitted, whether that violence constitutes a crime, and what crime, the medical examiner, as has been said, is happily not concerned.

Was it an accident to which, although another's act caused or contributed to it, the law attaches no blame? Was it an act of justifiable self-defense? Was it an assault, manslaughter, or murder? These grave and intricate questions the medical examiner is exempt from considering and deciding. These, together with questions relating to the admissibility of evidence, are as much matters of law as the sentence passed upon a convicted person. They are purely and solely for the court.

The medical examiner's business, as such, is finished with his report. He will, if it be a case of violence proceeding from another, be called upon to testify as a witness at the hearing and subsequent trial; but he is merely a witness, and has nothing further to investigate or decide. He has made the examination and determined the fact of violence, and now it remains for the court to establish whether the violence is or is not criminal.

Whether the courts, for want of evidence or other causes, do or do not proceed with their part of the matter, the examiner will nevertheless always do his duty, and never be discouraged or deterred from doing it by the fact that the other branch of the inquiry does not reach a satisfactory conclusion, or indeed any result at all. His line of duty is clear; his duties and the court's are distinct, independent of, and coequal in importance and value with, each other.

Having performed his duty, he is not called upon to shoulder the responsibility of the other's work also. Questions of evidence, of accident, of self-defense, of degrees of crime, these are not for him to decide. To repeat, then, "Whether a given death result from natural causes or not, so far as the body indicates, the physician's examination is competent, and alone competent, to decide; whether, the fact of violence being established by such examination, that violence constitutes a crime, and if so, what crime, the testimony of witnesses to external facts, and the law applied to those facts, alone can determine. In technical language, whether a homicide has been committed or not is a medical question; whether that homicide be the result of accident, or be justifiable homicide, or manslaughter, or murder, is a legal question." These words were written before the passage of the present law; indeed, they formed the criterion and basis of the division of functions in the new law. In other words, again, with a view to determining whether a death was one by violence caused or contributed to by another, the physical examination, supplemented by such inquiry as will assist his determination of that question, — this is the examiner's business, and his *alone*. With a view to determining whether that violence is criminal or not, and if criminal, in what degree, the hearing of sworn testimony,

passing upon its admissibility, and laying down the law, — this is the judge's business, and *his* alone. Neither can and neither should attempt to make a decision, or do anything whatever, which will in any degree interfere with the business of the other. The medical examiner, therefore, is not called upon to decide the question whether or not the violence was *criminal;* he cannot and never ought to do this.

The very purpose and foundation stone of the new law is to divide into its several constituent elements the work involved in the inquiry. Neither is, henceforth, ever again to be confused or mixed with the other. Each is the distinct and separate function of a distinct and different official. We are to remember, then, that the *inquest* is to be held by the court, — it is the *inquiry* into the facts outside the body; the *examination* is to be made by the examiner, and it leads the way to the inquest.

However difficult the solution of questions arising under the law may seem, it may be readily found by reference to the principle involved; the principles of the law are simple and well-defined. Its purpose is the detection of crime; its method, the division of functions among those properly qualified to perform them.

If I have dwelt upon this with too great insistence, and at the risk of being wearisome, you must forget it in the consideration that it is the corner-stone of the new edifice, and however imperfect as yet may be the superstructure, it must always rest upon this simple doctrine: that to get work efficiently done, states and nations, like individuals, must employ those whose proper employment it is and who are qualified to do it.

Undoubtedly improvements are desirable in the future, such as returning a body to the county where the deed happened, where the evidence is to be sought for, and where the superior court proceedings must be had, for the medical examination and report. Certain minor details of fees of trial justices and the like also escaped observation in the drafting of the law. This particular defect, however, was remedied by a short statute (chapter 235) passed during the session just closed. But it is wiser to wait before attempting any change until we know something more of the workings of the law as it stands, and have sufficient statistics to aid us in determining what changes are needed. It is better also to wait until a sufficient number of changes have suggested themselves as improvements, so that they may be acted upon at one time. When, therefore, the proposition was made last winter to amend the law in certain particulars, it was deemed best not to disturb it at present, but to await further results before attempting to improve upon it.

The new law has shown itself capable of producing exact, valid work, and its harmonious and successful operation cannot fail to exert a

good influence on the general public respect for laws. It is yet too early for an accurate statement, but so far as has been learned it is financially a marked improvement over the old law. Whether it shall continue to prove useful depends in great part on your endeavor to make it so. And, no doubt, it will so continue ; no doubt, with increasing familiarity and experience, your work under it will prove more and more important, and will more and more illustrate its capacity efficiently and worthily to support its part in the administration of the criminal law.

CASES ILLUSTRATING THE WORK AND DUTIES OF THE MEDICAL EXAMINER.

BY MEDICAL EXAMINER F. W. DRAPER, M. D.

When I received the compliment of an invitation to read a paper on this occasion, it was suggested that a report of cases would be acceptable, illustrating some of the difficulties which a Massachusetts medical examiner meets in the performance of his duties under the requirements of the law of 1877. Acting upon this suggestion, I sought for material adapted to its fulfillment; but while I found considerable evidence that the difficulties described had actually occurred, an impartial scrutiny showed that these mainly grew out of inexperience and maladroitness in a novel field of duty. In truth, Mr. President, this single year's record compels the conviction that the Massachusetts law of 1877 concerning medical examinations and inquests in cases of death by violence presents few and comparatively insignificant defects and difficulties to any one who recognizes the purpose of the statute and means honestly and conscientiously to execute it. I think the testimony will be concurrent that the law has had exceptional and gratifying success as a new and in a measure experimental piece of legislation. After further trial, experience may show that modifications may be made which shall mend without marring; meanwhile our society is to be congratulated that the general disposition at present is favorable to a fair test of this Massachusetts plan.

I shall be pardoned, therefore, if I feel disinclined to make an exposure of my own short-comings as a medical examiner. Let me address myself to a more congenial task. From the records of the year I have selected the notes of three cases which, on account of their somewhat remarkable character, serve to illustrate, not the defects of the new law, but some of its manifest advantages and capabilities of usefulness. These cases are as follows: —

I. Martin C., a robust and vigorous Irishman, thirty-three years old, came to his death under the following circumstances: He arose as usual at half past five o'clock in the morning of September 4, 1877. His wife was sure that she did not hear him complain of any illness at this time, or at any time previously for many months. She left him at

home on the morning above mentioned, while she went to market. On her return, at about seven o'clock, he was at breakfast, his meal consisting of boiled eggs, milk, and bread. After his breakfast he went out, for what purpose and to what place his wife did not know. In fifteen minutes he was brought back to his house by two men who were strangers to Mrs. C. These men stated that they had found C. lying in the middle of a street in a locality having an ugly reputation. When they first saw him two men were standing over him, who disappeared on their approach. Their statement in this respect was confirmed by a woman who lived in the neighborhood, and who saw the group from her window, but could not identify either of the parties. No one saw any blows struck or heard any outcry. No one could be found who had seen C. from the time he left his house till the time he was found prostrate in the street. C. himself could give only a confused account of his acts. When asked by the two men who assisted him where his home was, he gave the number correctly, but he was unable to explain his condition or the manner of its occurrence. In the course of other talk, incoherent in character, he said, "Johnny Murray struck me;" but other information was not forthcoming. On his arrival at home he lay down, complaining of pain in his side and in his head. He made repeated allusions to this latter pain. Without being specific about it, his utterances led his wife to believe that he had been assaulted. This suspicion was strengthened by neighborhood gossip, which mentioned names of witnesses of the supposed quarrel, but the witnesses themselves, when interrogated, professed ignorance of the entire affair.

On the day following the alleged assault C. complained still more of his head, and vomiting supervened. Thirty-one hours after he was found in the street a convulsion occurred, and now for the first time medical aid was summoned. More convulsions followed, and in three hours and a half the man was dead.

At the instance of the attending physician I was summoned by the police, the presumption being that in some manner not yet clear this man had met his death in consequence of violence. From all the facts then at hand this presumption was a reasonable one; at all events, the case was clearly one demanding investigation. Accordingly, being duly authorized by the district attorney, I made an autopsy, but not without some difficulty, for the widow and her neighbors were much excited, and, though strong in their belief that the man had been murdered, they were emphatically strenuous against a post-mortem examination.

Externally, the body presented the following appearances: over the angle of the right scapula was an ecchymosis of the size of an old-fashioned copper cent. On the posterior aspect of the right arm near the elbow was another bruise an inch by half an inch in diameter. These

were the only signs of wounds which a careful external inspection discovered. The regions of the head and neck were particularly examined, but nothing was found as the result of the alleged beating.

Except some indications of former inflammation of the right lung and pleura, the viscera of the chest and abdomen were normal.

Examination of the head revealed the following conditions: The scalp was healthy in all respects; there was no trace of extravasation or lesion indicating a blow. On removing the calvaria and the dura mater the vascular meninges were found to be hyperæmic, especially so on the right side. Within the middle lobe of the right cerebral hemisphere were two clots: one near the base of the brain, with well-defined outline, and having the size of an English walnut; the other a little higher and more posterior, and of about the size of a filbert. The former of these clots had broken through the gray cortex overlying it, and the hæmorrhage had given rise to a diffused coagulum within the meninges and extending from the base to the vertex. The lateral ventricles and other portions of the brain beside those described presented no abnormal appearance.

The cranium was in all respects normal and entire.

Cerebral hæmorrhage was the certified cause of death.

II. The dead body of Dora A. S., a middle-aged Irish woman of loose reputation, was found lying at full length upon the floor of her kitchen, early in the morning of November 26, 1877. When the body was first discovered, two men were seen standing near in the same room, in excited conference. These two men were at once taken into custody by the police, on suspicion, and the medical examiner was summoned.

On my arrival at the scene, the body was still disposed as it was found; it was lying upon the back, fully clothed. The limbs were straight, and there was no rigor mortis. The surface of the abdomen was still warm. Near the head there was a collection of semi-fluid, dark-colored matter, probably vomitus. Upon the right cheek was a faint ecchymosis. The clothing was soiled by a copious dejection.

Inspection of the room showed much disorder and slovenliness, with some evidences of violence. The table was set with dirty dishes and half-consumed food. In the midst of the dishes was a pint flask containing a few drops of inferior whisky. Two kerosene lamps were on the table: one of these was burning when the body was discovered; the fragments of the chimney belonging to the other were scattered over the table and on the floor. The furniture of the room was disarranged, but none of it was overturned.

Adjoining this kitchen were two sleeping-rooms, the beds in which were much tumbled. On the mattress of one of the beds was a plentiful deposit of dried blood. The furniture in these rooms showed very rough usage.

At an interview with each of the two suspected men at the station-house the following was presented as their version of the affair: The woman had been indulging in a drunken spree during the previous fortnight, obtaining money in various irregular ways and spending it mainly for liquor. One of the men was her paramour; the other was an acquaintance of twenty-four hours whom she had beguiled on the street. This trio, with other parties who happened in, spent the day (Sunday) before the woman's death in a drunken carouse, consuming ale and whisky freely. Late in the evening the paramour went to bed alone, less intoxicated (if I could believe his statement) than his companions. After an interval the other man succumbed, and the woman remained sitting by the table, very drunk. Each of these men persisted in the assertion that they had no quarreling or violence of any kind. The next morning, at seven o'clock, one of them arose and found the woman lying dead on the floor, but still warm. He aroused the other man, and while they were consulting what to do the party was discovered by the rent collector. Both the men stoutly denied any knowledge of the immediate circumstances under which the woman had died, or of the time of her death. The house was in a thickly-settled neighborhood, but none of the neighbors gave any information tending to make the case clear. The character of this locality, however, with the record of the woman and of her companions and the circumstances of her death, so far as they were learned, justified the presumption that violence was an element in the affair; accordingly an autopsy was required and made in farther investigation of the cause of death.

External inspection of the body discovered a number of faint, superficial ecchymoses with indistinct outlines; the largest of these was in front of the right ear, its dimensions being one and a half inches long by three quarters of an inch wide. Small bruises were found above the left nipple, over the sternum, in the bend of the right elbow, on the abdomen midway between the pubes and umbilicus, and on the right knee. None of these appeared to be recent. The external cavities of the body, the mouth, ears, nose, anus, and vagina, contained nothing abnormal. The scalp on dissection presented no mark of injury or disease. The skull was uninjured. The brain and its membranes were injected to a moderate degree; there was no extravasation of blood, meningeal or cerebral.

Except a small surface at the base of the right lung bound down by old pleuritic adhesions, the lungs were of healthy appearance. The trachea and bronchi were normal. The heart was healthy in all respects. The blood was fluid and of dark color.

The kidneys presented the typical appearances of chronic inflammation; they were lessened in size, their cortices were thin, their capsules were removed with difficulty, leaving the surface granular. Their section showed hyperæmia.

The spleen and intestines were normal. The liver was mottled, dense, and injected.

The uterus was enlarged, and its mucous membrane was hypertrophied and congested.

The stomach was the organ presenting the most noteworthy alteration. Its entire mucous lining showed intense hyperæmia, without erosion at any point; these appearances were most marked at the fundus. The minute disseminated ecchymoses were too numerous and too uniformly spread to be accounted for by digestion or by post-mortem changes. The œsophagus was reddened at its lower extremity, but elsewhere it was unaltered.

The contents of the stomach, the blood, the brain, and the thoracic viscera imparted a distinct alcoholic odor.

In the presence of these post-mortem appearances I felt obliged to exclude the element of violence from the cause of death, and to assign to alcohol the principal and immediate blame.

III. Ellen S., thirty years old, a domestic servant in the family of a wealthy and well-known Brookline gentleman, died in Boston, February 5, 1878. She had left her place in Brookline three weeks previously, being at that time somewhat debilitated, and complaining of ill-defined but not severe illness. She declined the urgent offers of her mistress to provide medical attendance and nursing for her, and declared her preference to go to some friends in Boston, to remain till she recovered. These friends were poor in circumstances and in reputation, fond of alcohol and of its exhilaration. Ellen stayed at their house a week without seeking medical aid. She appeared exhausted, had no appetite, suffered some abdominal pain. At the end of the week she went with another girl to the office of a regular physician, who, however, had been charged a long time ago with some irregular practices; she received from him two prescriptions. This medicine was dispensed by a neighboring druggist who retained the recipes. The physician visited her at her house twice subsequently, on the two days following the office call; at his last visit he informed her that she would be sick some time with fever, and advised her, as she had but little money, to enter the City Hospital. This advice she declined to follow, and he did not see her again.

Through the next five days following this last medical visit Ellen had no physician, but at the end of that time she grew suddenly and alarmingly worse, her symptoms being chills, exquisitely painful abdominal swelling, high fever, vomiting, and great thirst. An irregular practitioner was now called in. He was struck at once by the swollen belly, and, without any vaginal examination, charged his patient with pregnancy, — a charge which she denied. Then, learning that Ellen had a lover who had recently given her some money, and that she had con-

sulted Dr. ——, he persisted in his suspicion that he had a case of criminal abortion on his hands, though there was no hæmorrhage or lochial discharge, and a physical examination was not had. He conveyed his suspicions to the late mistress of the girl, and occasioned considerable excitement in that lady and in her family. Meanwhile, the patient sank, and died in great distress, and without having at any time or to any person, so far as could be learned, acknowledged any facts giving color to a suspicion of wrong practices, yet dying under conditions that might be, and were, readily formed into a basis for the presumption of such conduct.

Acting in obedience to his convictions, the doctor gave me notice of his case and of his interpretation of it, and demanded an investigation. His peremptory zeal was seconded by the warm appeal of the former employer of the deceased that I would leave nothing undone to bring the offender to justice, or, by a thorough inquiry, clear the dead girl's character of the imputation now resting upon it.

I believed I saw more of zeal than discretion in all this crimination, and did not enter on the case with much expectation of seeing judicial proceedings result. I did, however, realize the facility with which grave charges are sometimes made upon slight foundation in fact, and this instance seemed an example. Because, therefore, it was an official obligation, not less than because a medical examination would probably make clear that which was now obscure, I took charge of the dead body, directed its removal from the keeping of its drunken guardians, and sought, by dissection, for the cause of death.

This autopsy was made fifty-five hours post mortem. Omitting its details, I may summarize its results as follows: There was abundant evidence of general peritonitis, with suppurative exudation. In the right broad ligament of the uterus an abscess had developed, matured, and ruptured, the exceedingly offensive purulent contents having escaped into the abdomen to originate the mischief there. The cavity of this abscess was of the size of a large orange.

The uterus was very slightly enlarged. It showed no appearance whatever of recent impregnation, of disease, or of mechanical injury; its mucous membrane was entirely normal. The vagina, likewise, was healthy.

The stomach and intestines gave no indication of violent treatment, by drugs or otherwise.

The cause of the death was certified to the registrar and to the district attorney as pelvic abscess resulting in general acute peritonitis.

If time and your forbearance permitted, other similar cases might be added to the foregoing; but those related will suffice to illustrate the purpose of this paper. It must be obvious that these three deaths were

attended by circumstances which gave them a distinctive and exceptional character. If the testimony of parties claiming to be cognizant of the concomitant facts was to be credited, neither of the three individuals died in consequence of the operation of natural causes simply. Nor was either of the deaths a death by *violence* simply, according to the ordinary interpretation. They differ, on the one hand, from the instances of sudden death in which the individual, in the midst of his family or friends, expires in the course of nature without a warning; and, on the other hand, the inspection of the bodies furnished no external, unequivocal sign to point the way to a clear medical opinion that violence had been actually used. So that, in the first instance, all these cases, as to the cause of death, lay under great uncertainty. In one respect, indeed, they had a community of character; over all of them rested the suspicion, approaching to a reasonable presumption, that the deceased persons came to death in consequence of unlawful acts on the part of other persons, and this regardless of the unrestrained neighborhood gossip which always speaks the word "murder" glibly and inconsiderately. Specific accusations were indeed expressed, and in one of the cases arrests were made. In two of the cases the attendant lent the weight of his medical opinion in favor of the theory that violence had been done to the persons of the deceased. Now, these elements, once imparted to the cases, could not be excluded off-hand; they required consideration, they compelled attention. These three dead bodies with their equivocal environments might readily present, on that account, problems for solution more difficult than they could have done had they been found with their identity and history actually unknown. Cases of this kind, therefore, offer the opportunity for the application of forensic medicine in its highest function; they demand patient investigation, an unbiased judgment, deliberate caution, intelligent search for the truth, judicious reticence. Upon the answer to the question in such instances, "What caused this person's death?" depend not only individual interests, but in the broadest sense the conservation of public morality and the promotion of justice.

How does the Massachusetts law of 1877 meet these and similar cases? I have intimated that the law possesses special advantages in this regard. Without exhausting the list, let me mention three of these: —

In the first place, the law provides that a purely medical question shall be solved by a medical man, whose conclusions are preliminary to other proceedings in the case. It creates a medical examiner, and demands of him that he shall determine the cause and manner of death, and that alone. It leaves him free to prosecute his inquiries from the medical stand-point simply. It does not hamper him with a complica-

tion of functions; it does not compel him to be a physician, a detective, a constable, a judge, and a juryman, all in one. The question, "Who caused this death?" is not for him; it is of no concern to him except as it is related immediately to the solution of that other question for the answer to which he is directly responsible, namely, "What caused this death?" He is not to lose sight of the fact that he is a physician in the employ of his county, to do a physician's work. He has no need or right to embarrass himself with speculations about murder, justifiable homicide, or simple assault. The law thus aims purposely to remove him beyond the influence of bias and the thralldom of technicalities, and makes it his single aim to ascertain the truthful solution of a purely medical problem.

But, secondly, the law does not create this medical examiner and leave him without the requisite facilities and authority for prosecuting his investigations in a strictly medical manner. It makes easy the one method of inquiry which is indispensable, — the necropsy. It interposes such safeguards and checks only as are needed to prevent the abuse of the authority conferred. The machinery is simple, direct in application, effective. There is no circumlocution, no delay in action. The problem and the agent for its solution are brought into immediate relation.

It thus happened, in each of the three cases cited, that the application of the methods provided by the Massachusetts law cleared up at once and authoritatively matters that were involved in much doubt and obscurity; resolved and dismissed the imputation of crime; and by a determination that the cause of death was not by violence at the hands of others fully satisfied the requirements of public order and of justice.

And this leads us to the third consideration in behalf of the new law, one which you must have already anticipated, namely, that with the medical report in such cases the official investigation comes to an end, save in circumstances exceptional to the last degree. Thus, as all will recognize, the medical examiner is a responsible agent by whose professional knowledge the public treasury and the public comfort and morals constantly profit in that he is a stay to what, under other circumstances, would be unnecessary, expensive, and, possibly, scandalous inquests.

A CASE OF ARSENICAL POISONING,

WITH FATTY DEGENERATION OF THE LIVER, KIDNEYS, AND GASTRIC GLANDS.

BY MEDICAL EXAMINER J. G. PINKHAM, M. D.

HARRY C., aged four years, previously in good health, was taken on the morning of November 19, 1877, with vomiting and gastric distress. As the physician who was called failed to recognize the true nature of the attack, and no appropriate remedies were administered, the case may be said to have progressed without treatment. According to the statements of the child's attendants the symptoms above mentioned continued with increasing severity until the morning of the 21st, about forty-four hours after the onset of the attack, when death occurred, preceded by stupor and convulsions. The vomited matters, which were dark-colored towards the last, were thrown away. Suspicions having been excited as to the cause of death, the writer, as medical examiner of the district, was summoned to investigate the matter, and an autopsy was made thirty-four hours after death, Dr. C. A. Lovejoy assisting.

The body was found to be well nourished. It presented the usual appearances resulting from hypostatic congestion. There was no rigor mortis. A careful examination was made of all parts accessible without section, and nothing abnormal discovered except slight parching of the lips, and some excoriation on the inside of the right cheek.

On section of the head the dura mater was found firmly adherent to the calvaria, as is usually the case in young children. There was a moderate amount of serum in the lateral ventricles, but perhaps no more than normal. The brain and its membranes were in appearance healthy. On laying open the abdominal cavity attention was immediately arrested by the large size and bright yellow color of the liver, the condition of which was obviously one of extreme fatty degeneration. On raising its lower margin the gall-bladder was seen to be distended with bile, some of which had transuded, staining the tissues beneath. The spleen was of normal size and color. The kidneys were of somewhat lighter color than usual, this appearance being especially observed in the cortical portion after section; but some of the pyramids of Mal-

pighi were very dark. The stomach was removed entire, ligatures being placed above and below, and it, together with the liver, kidneys, and spleen, was sent to Dr. Wm. B. Hills, of the Harvard Medical School, for a chemical and microscopical examination.

The intestines were carefully examined, and it was found that the mucous membrane of the duodenum was intensely red and swollen, and covered with a tenacious coating of mucus. These conditions obtained also in the jejunum and ileum, decreasing from above downwards. The mucous membrane of the colon was somewhat reddened. The rectum was partially distended with solid fæces, its mucous membrane being normal in appearance, or nearly so. The bladder was empty and contracted. The heart and large blood-vessels appeared healthy. The right auricle was distended with black, somewhat firmly clotted blood; the left auricle was empty. The right ventricle contained a small amount of blood, partially clotted. The left ventricle contained a small clot, a portion of it decolorized. The valves were normal. The larynx, trachea, bronchi, lungs, and pleuræ were healthy in appearance.

The spinal cord was carefully examined, and no indications of disease or injury were discovered in either it or its membranes.

Dr. Hills returned the following report, which I present in a somewhat condensed form: —

"The stomach contained two and one half fluid ounces of a dark-brown, viscid liquid, which on standing deposited a reddish-brown sediment containing many dark-red bits of substance of varying size, which, on microscopic examination, proved to be little clots of blood. The color of the liquid was found to be due to admixed blood and bile. In addition to blood corpuscles the microscope showed epithelial cells from the glands of the stomach, a large amount of granular matter, and a considerable number of crystals of arsenious acid. In the course of four or five hours' searching I discovered perhaps three hundred of these crystals.

"The mucous membrane of the stomach was observed to be somewhat swollen, and covered with a closely-adhering coat of mucus. It was for the most part pale in color, but reddened in patches, particularly over the greater curvature, the redness assuming principally a dotted form. There were also a few small dark patches near the pylorus, due to blood effused beneath the mucous membrane. Under the microscope the liver appeared to be in a state of extreme fatty degeneration, a fact obvious, indeed, to the unaided eye. There was quite extensive fatty degeneration of the kidneys, and also of the epithelium lining the peptic glands. One fifth of the contents of the stomach and one fifth each of the liver, kidneys, and spleen were tested together for the mineral poisons by appropriate methods. The result of this analysis was the discovery of arsenic. A portion of the liver (one fifth) tested sepa

rately for arsenic failed to show its presence. The contents of the stomach, tested as in the first instance, revealed unmistakably the presence of arsenic.

"No separate examination was made of the spleen or kidneys. It was not thought advisable to make a quantitative analysis without a special order from the medical examiner or court. It was estimated, however, that there might be one half grain of white arsenic in the contents of the stomach."

The symptoms in this case, the post-mortem appearances, and the result of the chemical analysis make it certain that the death was caused by poisoning with arsenic.

The extensive fatty degeneration observed suggests several inquiries, which I shall state, and endeavor briefly to answer.

(1.) Was this fatty degeneration due to the action of the arsenic?

This question must be answered in the affirmative, for there is no other cause to which the morbid change could reasonably be ascribed, inasmuch as the child was in good health before its two days' illness, which was undoubtedly due to the poison; and, besides, it is now a well-recognized fact that arsenic, in common with phosphorus, antimony, and various other poisons, will cause fatty degeneration, and in a space of time even less than was occupied in this instance. In support of this latter statement, H. C. Wood, Virchow, Rindfleisch, Casper, Hoffmann, Tardieu, Orth, Wagner, and other authorities might be cited.

There is, however, a singular absence of references to this subject in our standard English works. Even the latest edition of Taylor's great work on Medical Jurisprudence (1873) simply speaks of a case observed by Dr. Greiner, but says, in general terms, "The liver, spleen, and kidneys present no appearances which can be connected with the action of arsenic, although these, like other soft organs, may become receptacles of the absorbed poison." [1]

On the other hand, Casper says, "We find often in arsenic poisoning a fatty condition of the liver, heart, and kidneys." [2]

Naunyn speaks of this action of arsenic as a recent discovery; and so it must be regarded, since only recent publications give it full and explicit recognition.[3]

This fact is all the more remarkable from the prominence of arsenic in the literature of medical jurisprudence. Probably no other substance has been used so frequently with criminal intent. Its tastelessness, the ease with which it can be procured, and the certainty of its action have combined to render it a favorite agent of destruction with the Borgias and Tophanias of nearly all countries. Hundreds of cases of arsenical

[1] Principles of Medical Jurisprudence, vol. i., page 254.
[2] Hand-Book of Legal Medicine.
[3] Ziemssen's Cyclopædia (Am. Trans.), vol. xvii., page 54.

poisoning have been studied and recorded, and yet, strange to say, the remarkable phenomenon under consideration has not been clearly recognized, at least in our own country and England, until within a comparatively few years. But its occurrence must now be considered as established beyond the possibility of question.

(2.) In what way does arsenic act to cause fatty degeneration?

The most plausible theory seems to be that the fatty degeneration is the final stage of a parenchymatous inflammation, resulting, probably, from the direct irritant action of the poison after absorption. The irritation so produced causes an increased absorption of nutritive material — albuminates, and possibly fat — into the cells, which become enlarged, presenting the condition known as granular degeneration (in its higher stages, the cloudy swelling of Virchow), and undergoing finally the fatty change.

Orth, in his Compend of Diagnosis in Pathological Anatomy, an excellent work, now happily accessible to us all, in speaking of affections of the stomach (page 289), says, "The next in frequency [to acute and chronic catarrh] is what is styled by Virchow parenchymatous inflammation, and like the corresponding affections of the kidneys, liver, etc., which appear in certain cases of poisoning (phosphorus, arsenic), in acute infective diseases and similar affections (acute atrophy of the liver), consists in a cloudy swelling, and at a later stage fatty degeneration of the cells of the gastric glands."

Again (page 322), in speaking of the liver, he says, "The more extreme degrees of parenchymatous inflammation, when the cloudy swelling results in fatty degeneration, occur principally in two affections, — in poisoning by phosphorus (also arsenic) and in acute atrophy of the liver, the ætiology of which has never yet been ascertained. In cases of *phosphorus poisoning* the nature of the process is by no means universally agreed upon, as an abnormally large, bright-yellow liver, with icterus, greatly resembling the ordinary jaundiced, fatty liver, is often found; in consequence of this resemblance certain authors have maintained that the two are identical, and deny the existence of the parenchymatous inflammation. Other authorities (Virchow, Rindfleisch) contend that the essence of the process is a parenchymatous inflammation, in which, according to Rindfleisch, large fat drops are formed, while according to Virchow both fatty degeneration and fatty infiltration occur; and the latter may also be due to the phosphorus, which may possibly render the cells more capable of containing fat. At any rate, upon microscopic examination, besides the cells containing large *fat drops*, like those seen in fatty infiltration, others are found beginning to disintegrate, which is usually not the case in infiltration. This question might be *positively settled*[1] if atrophy of the liver resulted by the

[1] The italics are mine.

absorption of the fatty detritus, but death always occurs before this can take place, and a well-authenticated case of atrophy after phosphorus poisoning has never been observed." This was published in 1876. In the *British Medical Journal* for April 6th of the current year a case is reported in which an autopsy revealed atrophy of the liver after death from phosphorus poisoning. The person lived about eight days after taking the poison. He had had liver disease seven years previously. If this case be regarded as authentic, then, according to Orth, the question as to the nature of the fatty change in phosphorus poisoning is definitely settled in favor of the view that there is an actual degeneration, and not an infiltration alone. The reporter of this case regards it as confirmatory of the opinion expressed by Wagner that many instances of acute atrophy of the liver are really cases of phosphorus poisoning.

Although the above refers to poisoning with phosphorus alone, yet as this substance produces the same result as arsenic it is reasonable to conclude that any explanation of the action of one would be true also of the action of the other.

Various theories have been advanced to account for the final change by which the albuminates of the affected tissues are converted into fat or displaced by it; but this question is one which pertains to the pathology of fatty degeneration in general, and does not come within the scope of this paper.

(3.) In what length of time will arsenic cause fatty degeneration?

Casper mentions a case, fatal in ten hours, in which fatty degeneration had commenced in the liver. In another case, reported in *Virchow's Archiv*,[1] death occurred in seventeen hours, and there was found fatty degeneration of the heart, diaphragm, liver, and kidneys.

Saikowski[2] made numerous experiments upon animals, to elucidate the question of the action of arsenic and other poisons in causing fatty degeneration. He found that comparatively large doses of white arsenic (two grammes) given to rabbits produced in twenty to twenty-eight hours fat in the liver, kidneys, and muscles of the heart, just as in cases of chronic poisoning with small doses. There is reason to suppose that arsenic begins to exert its irritant action as soon as it is absorbed into the tissues. It has been proved by chemical tests that it may reach the liver in four hours after ingestion. The minimum time required for the subsequent changes has not been determined; but from what has been already demonstrated, we are safe in asserting that the final stage of fatty degeneration may be attained in a few hours after the poison is absorbed.

(4.) Is arsenic always found in the affected tissues?

[1] Vol. xxxiv., page 208.
[2] Virchow's Archiv, vol. xxxiv., page 73.

This question must be answered in the negative. In the present case Dr. Hills found no arsenic in the liver, although that had experienced its extreme effects. In the case before mentioned as fatal in seventeen hours no arsenic was found in the contents of the stomach or intestines, in the liver, spleen, or kidneys. Yet arsenic was without doubt the cause of death in this instance, and both the liver and kidneys were in a state of fatty degeneration.

This failure to find arsenic in the tissues is by no means an unusual circumstance. Two explanations suggest themselves: first, that the poison exists in so small quantities as not to respond to the tests employed; and, second, that it may have passed out in the process of elimination, leaving only its mischievous effects behind. Authorities generally concur in the statement that absorbed arsenic cannot always be detected, or that it *has* not always been.

(5.) How frequently does fatty degeneration follow poisoning by arsenic?

Dr. Hills, to whom I am indebted for much valuable assistance in looking up the authorities on this subject, has references to upwards of forty reported cases, mostly in foreign journals.

As the fact of the occurrence of this phenomenon passed so many years unrecognized, we may dismiss the greater number of cases in which it was not observed as by no means proving a negative, even in those instances. When death occurs a short time after the ingestion of the poison there may be only granular degeneration, or the very beginnings of the fatty change. It would require, oftentimes, the use of the microscope by an expert in pathology to detect these conditions. Exact pathological research is not common among physicians. For these reasons there is little difficulty in believing that in many cases of arsenical poisoning fatty degeneration has existed without being discovered.

Saikowski[1] found fatty degeneration to follow uniformly the administration of arsenic to rabbits.

It is proper, then, to conclude that fatty degeneration very frequently results from arsenical poisoning. Probably either it or the preceding condition of granular degeneration is always present.

(6.) What is the medico-legal value of the facts observed?

The first consideration that presents itself is that the medical examiner, if not familiar with the fact that certain poisons cause fatty degeneration, might conclude, on opening the abdomen in a case like the present, that he had discovered the cause of death in the notable disease there manifest, and refuse or neglect to search further. He would be all the more likely to reach this conclusion if the subject of the examination had been intemperate or out of health previous to his final ill-

[1] Loc. cit.

ness. But even in this case he might be in error, for intemperance, or ill health, and fatty degeneration might coexist without being related as cause and effect; and, besides, fatty degeneration, at least of the liver, is not always to be regarded as a sufficient cause of death. When it occurs as widely diffused as in this instance it must be looked upon as presumptive evidence of poisoning. The presumption would be much stronger if the history of the case excluded other rapidly acting causes, like acute infective diseases.

Therefore, in all cases, fatty degeneration should cause augmented suspicion of poisoning, and lead the medical examiner to continue his search. He should not rest satisfied with an examination of the stomach and organs manifestly affected, but extend his explorations even to the brain and other parts not usually submitted to the chemist.

I close with the following summary of conclusions: —

(1.) It is an established fact that arsenic, in common with phosphorus, antimony, and other poisons, will cause fatty degeneration of the liver, kidneys, gastric glands, heart, and other organs.

(2.) It acts after absorption, probably by its direct irritant power, causing parenchymatous inflammation, the final stage of which is fatty degeneration.

(3.) This effect may be produced in a few — certainly in ten — hours after the ingestion of the poison.

(4.) Arsenic cannot always be detected by chemical tests in tissues which have experienced its extreme effects.

(5.) Fatty degeneration is a frequent result of arsenical poisoning. Probably either it or the preceding condition of granular degeneration always exists.

(6.) The discovery of fatty degeneration post mortem, especially if widely diffused, should be regarded as presumptive evidence of poisoning, and as warranting a thorough chemical examination.

REPORT OF THE CORRESPONDING SECRETARY.

BY MEDICAL EXAMINER FREDERIC WINSOR, M. D.

It must be understood that the report which I have the honor to make has for its material the work of the six months ending December 31, 1877, and also that this was done under a statute of the commonwealth and under society by-laws altogether new to the medical examiners who did the work and reported to the corresponding secretary. As a matter of course there has been, in performing duties so unfamiliar, less method, accuracy, and promptness than may fairly be expected in the work of succeeding years.

During the six months which this report covers, forty-one of the fifty medical examiners who have joined this society made 443 "views," in 116 of which autopsies were made. Ninety-nine inquests have been held, leading to 21 prosecutions, of which 5 resulted in conviction. In these 443 cases, death resulted from natural causes in 102; from railroad accidents in 77; from other accidents in 129; from suicide in 71; from violence in 51.

It is of course desirable to pursue the analysis farther, and learn what modes of suicide were used, what was the most frequent form of fatal accident, etc.; but it is not possible to do so with regard to all the cases, 186 having never been reported in detail to the corresponding secretary.

Some information of interest may be obtained, however, by analyzing the remaining cases, and it appears that of 32 cases of suicide 12 were by hanging; 1 was by strangling; 6 by poison; 3 by drowning; 3 by shooting; 3 by railroad train; 2 by cutting the throat; 1 by stabbing; 1 by leaping from a height. Arsenious acid was the poison used in 2 cases, opium and morphia in 2 other cases.

Of the persons committing suicide 5 were known to be insane.

Of 64 deaths from accidents not caused by railroad carriages there were from drowning 36; from falls 7; from heavy falling articles 6; from inhaling coal-gas 5; by being run over 4; from machinery 2; from burning and scalding 2; from burning at lime-kiln, after suffocation by its gas, 1; by shooting 1.

Of the deaths by accidental drowning, 4 were of persons previously known to be insane.

One naturally asks, What proportion of these deaths by suicide or accident were preventable? The answer is, Very few under the existing state of things. But by judicious legislation the proportion of such deaths might be materially diminished. It is preposterous that no restrictions should be put upon the sale of poisons in this commonwealth. As the law now stands, *any one* can

obtain for a few cents, at the nearest apothecary's shop, a fatal dose, and he may take his choice of half a dozen poisons. There is no reason to suppose that the provision of the present law, which requires the vender to keep a register of the name and residence of the persons purchasing certain specified poisons, is complied with in one quarter of the cases.

In view of the great loss of life by drowning, it seems within the function of the State to furnish instruction in swimming, and in resuscitating persons nearly drowned. To the writer it appears that such instruction might with propriety be grafted upon our public-school system. It must, however, be said that a very large proportion of the persons drowned, and so coming under the "view" of the medical examiner, were intoxicated at the time of the accident.

Much may be done to diminish the frequency of poisoning by coal-gas if the public can be informed as to the nature of the danger and the means of prevention, and if a public sentiment can be roused against "dampers" which close smoke-pipes and obstruct the escape of poisonous gases into the open air.

It is not generally known that of fatal railroad accidents quite one half happen to persons walking on or near the track, often while intoxicated. Now, if railroad corporations and the towns through which the roads pass can devise means to prevent such walking, fifty lives would be annually saved to the commonwealth.

Finally, whatever tends to lessen drunkenness acts directly to diminish accidents of all kinds. If it were possible to put a stop to it, accidents would be diminished by one half.

Instead of criticising unsatisfactory reports of cases, and pointing out their defects, it seems wiser to submit to the society a few of the many reports which are excellent, in the hope that they may serve as standards for future work.

Case VII.[1] (1.) View in Wakefield, on east shore of Lake Quanaponitt.
(2.) May 22, 1878. Twelve, noon.
(3.) Summoned by H. Haskell, Jr.
(4.) Male. Age unknown, one to five days. Nationality unknown.
(5.) Name and residence unknown.
(6.) This body of a male infant was found floating in the water, a short distance from the eastern shore. Wind blowing freshly from the west. Body beating up and down against the rocks. On the shore near the body was a woven cotton and wool undershirt, sleeves cut off, partly filled with coarse sand. Flakes of epidermis were adherent to the inside of the shirt. The body of the infant had around its neck a piece of cord (clothes-line) 1.5 m. in length. This cord was twice around the neck, but very loosely, and was

[1] The numeral references in these illustrative cases correspond with the following "order of items" by which members of the society are guided in preparing their reports for the corresponding secretary: (1.) State locality of view. (2.) Date and hour. (3.) By whom summoned. (4.) Sex, age, and nationality of person found dead. (5.) Name and residence of deceased (if known). (6.) Position and condition of body. (7.) Circumstances determining decision of medical examiner. (8.) Autopsy and its results. (9.) Microscopical and chemical examination. (10.) Inquest and its results; whether or not followed by prosecution and conviction of any person implicated.

knotted. There was also thrice around the neck a piece of cotton twine, one m. in length. The large cord was caught in a small bush at a short distance from the shore, and parted in the attempt to land it.

Time of Death. — In my opinion death occurred between May 1 and May 15, 1878.

(7.) Decision of medical examiner and circumstances determining it: —

(*a.*) Maturity of child. Full term. (*b.*) Was it born alive? Position of diaphragm, appearance and condition of lungs (hydrostatic test), contents of large intestine, would all indicate that it had lived and breathed. (*c.*) If born alive, how long did it live? Between twenty-four hours and five days. Absence of meconium and color of fæcal matter in colon indicated an age of more than twenty-four hours. Condition of funis, less than five days. (*d.*) *What was the cause of its death?* I see no reason to doubt that it was thrown into the water alive, and perished from drowning, being doubtless tied up in the shirt already mentioned.

(8.) *Autopsy*, occupying forty-five minutes. *External examination.* — The body is (*a*) that of an apparently mature infant, fifty-two cm. in length, weight about five kilogr. A well-nourished infant. Arms and legs fat. (*b.*) Body pale and white generally. Abdomen and scalp bluish-green. (*c.*) Some thin, sanguineous fluid escaped from the mouth and ears. (*d.*) Hair thin and scanty. Eyes flabby and colorless (opaque). No teeth. Jaw-bone protruding through mucous membrane on left side (sup. max.). Roof of mouth deficient (from decomposition). (*e.*) A considerable portion of the flesh of the right shoulder (half-way down the arm) appeared to be torn or gnawed away; also two small spots about the back. (*f.*) Chest full. Abdomen much distended. (*g.*) Scrotum swollen. (*h.*) Epidermis wanting in exposed parts of the body. Adherent in the folds. (*i.*) Funis six cm. in length, firm, no ligature around it.

Internal Examination. — (*j.*) *Cranial cavity.* Scalp of moderate thickness, loose and flabby. Cranial bones appear loose within it. Bones well developed for a child at maturity. Sutures widely separated. Cerebral matter entirely gone.

Thorax. (*k.*) Incision from neck to pubes. Adipose tissue abundant. Muscles pale. Peritoneal cavity distended with gas. (*l.*) Diaphragm not highly arched. (*m.*) Position of abdominal organs normal. Sternum removed. (*n.*) Right lung distended, bright red in color. Left lung less distended, reddish-purple. Both lungs crepitant, and studded on the outside with vesicles. No fluid in pleura or pericardium. The vesicles on the surface of the lungs were carefully opened, and the lungs placed in a pail of fresh water. They floated high on its surface. (*o.*) The heart appeared normal, about the size of the child's fist. It contained no blood in either ventricle.

Abdomen. (*p.*) Stomach, kidneys, and portions of small intestines decomposed, and not readily distinguishable. (*q.*) Liver, dark purple, soft, and readily torn. (*r.*) Bladder empty. (*s.*) Colon filled with light-brown fæcal matter. No meconium.

(9.) Microscopic examination of skin on the shirt showed it to contain hairs, and consist of similar epidermis to that upon the body of the infant.

(10.) No inquest, no additional evidence being found.

S. W. Abbott, Medical Examiner, Third Middlesex District.

VII. (1.) View of body at Westville Street, Dorchester.

(2.) July 22, 1877. One p. m.

(3.) Friends of the deceased.

(4.) Female. Twenty-nine. American.

(5.) Cynthia S. Phillips. Westville Street, Dorchester.

(7.) Deceased was one of a party at a picnic at Silver Lake, June 28th. She, with others, was on a small steamer whose boiler exploded, by which accident she was severely burned and scalded about the nates and posterior aspect of both thighs. She lingered in great distress twenty-five days, and died of exhaustion consequent upon her injuries. The ulcerations did not heal except at small points.

(8.) *Autopsy* discovered the extensive granulating ulceration above described, but nothing farther to account for death. The internal organs were healthy.

(10.) Inquest before Judge Churchill found evidence of culpable negligence on the part of the boat owners. Upon this finding was based a settlement of claims preferred by the husband of above deceased, and by other persons injured at the explosion.

The inquest in this case was ordered by the district attorney in accordance with Section 10 of Chapter 200, Acts of 1877.

F. W. Draper, Medical Examiner.

XVIII. (1.) Boston City Hospital.

(2.) August 10, 1877. 7.40 p. m.

(3.) Hospital clerk.

(4.) Male. Sixty. Irish.

(5.) Dennis O'Brien. 143 Ruggles Street, Boston.

(6 and 7.) In the course of an altercation with one James Hurl, the deceased, who was drunk, was thrown to the ground, and in that position was punched by Hurl with his knees. O'Brien at once gave loud groans, as if in great pain, and was unable to walk. He was carried to the hospital, where he died on the day following, showing symptoms of internal hæmorrhage.

(8.) An *autopsy* found two quarts of red fluid exudation in the abdomen and thorax together; two ribs were broken; two ribs on one side and four on the other were loosened and partly detached from their spinal articulation; the lower lobe of the right lung was engorged; the liver was lacerated superficially on its inferior surface; in the interior were two clots of blood of the size of a lemon.

(10.) An inquest by Judge Churchill found Hurl guilty of manslaughter, but the grand jury reported "no bill."

F. W. Draper, Medical Examiner

XLIII. (1.) 45 Melrose Street, Boston.

(2.) October 27, 1877. 7.20 P. M.

(3.) Police.

(4.) Male. New-born. Unknown (if not "American").

(5.) James Williams. 45 Melrose Street, Boston.

(6 and 7.) This new-born baby was found dead by its mother's side in bed. The mother had concealed her pregnancy and her labor, and the condition of things was discovered by people in the house by accident. The child had been born three hours when found; the mother said it lived "a few minutes." She had no baby clothes ready, and had made no engagements of doctor, or nurse, or lying-in help. She claimed that her husband was dead.

(8.) *Autopsy.* No marks of violence. A portion of cord eleven inches long hung from navel; its end was ragged, as if torn off. Lungs were crepitant and buoyant, showing respiration. Foramen ovale of heart was closed. The meninges were congested.

(10.) Inquest found infanticide by neglect, and the case came before the grand jury. "No bill." F. W. DRAPER, Medical Examiner.

(1.) City of Taunton. County of Bristol. In house on Court Street, where deceased had lived.

(2.) November 1, 1877. Three A. M.

(3.) The police.

(4.) Male. Sixty-five years. Irish.

(5.) Patrick Laughna. Taunton. Court Street.

(6.) Lying upon floor of kitchen, without mark or bruise.

(7.) The fire-alarm was struck, and Laughna got up, as had been his custom in such cases, and opened the window to look for the fire. Soon his daughter heard the sash fall, and heard her father groan. She came to him, and found him hanging by the neck, the sash resting upon the back and side of his neck. She released him, but "he breathed but once or twice afterwards."

(8.) No autopsy.

(10.) No inquest. SILAS D. PRESBREY, Medical Examiner.

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THE EVIDENCE OF STILL-BIRTH.[1]

BY MEDICAL EXAMINER S. W. ABBOTT, M. D.

HUMAN bodies come to the notice of the medical examiner at all periods of existence, from even the early stages of fœtal life down to old age. The transition from each of these so-called periods to the succeeding is, with one exception, so insensible and gradual as to be imperceptible. That exception is the stage of development which marks the passage from intra to extra uterine life. No preceding or subsequent stage of life is so sharply divided or so well defined as this. The sudden awakening of the human embryo to a new life in the outer world, attended as it is by a complete revolution in its condition, with the addition of respiration to its hitherto gradually acquired functions; the obliteration of old channels for the passage of vital fluids; the sudden and almost violent deprivation of its original blood supply by the division of the funis; the change from a uniform to a variable temperature, from a submerged life in fluid to one in air, — all these conditions render it a matter of wonder that so large a proportion survive the first moments of independent existence.

All still-births are in both a physical and in a legal sense deaths, and are so recognized by the State of Massachusetts in its official returns of cities and towns.[2] Of the forms of death which come to the notice of the medical examiner, the still-born and others occurring within the first week will necessarily form an important part,[3] and hence the question will often arise, "Was this infant born living or dead?"

In this connection, and in a consideration of the statutes, which are our rule of action, the question naturally arises, "What is, legally, a dead body?" The term *dead body of a person* occurs both in the old inquest law and in the new medical examiner law of 1877. But as no definition of the term *dead body* is given in the law, the interpretation must be somewhat at the discretion of each medical examiner.

So far as the dead bodies of fœtuses are concerned, even in the early stages of embryonic life, I know of no reason, under Massachusetts laws, why they should not *all* come under the cognizance of the med-

[1] Read at the February meeting of the Massachusetts Medico-Legal Society, 1879.

[2] Records of Massachusetts Medico-Legal Society, Corresponding Secretary.

[3] Autopsies of new-born children in Berlin constitute almost a fourth of all cases. Casper's Forensic Medicine, vol. iii.

ical examiner. Any attempt on our part to draw a line of distinction between the extremes of fœtal life would subject us to popular misapprehension, and make us guilty of the error of the British law, which established a distinction between the animate and the inanimate embryo,[1] a principle both morally and physiologically false. A fœtus is a person, a human being, physically, morally, and legally, and may inherit property, even during the earliest periods of embryonic life.[2]

While this is true, it is also necessary that any such child should be viable when born in order to succeed to an inheritance. Hence the question of viability may become a matter of vital importance in a given case, so far as inheritance is concerned, but under Massachusetts laws it cannot in any way affect the status of a case of fœticide or criminal abortion.

The examination of newly born infants requires a thorough knowledge of fœtal anatomy, and whenever an autopsy upon such a body is required it should be made with as much care and thoroughness as in the case of adults, certain organs requiring even more careful attention, as the lungs, heart, blood-vessels, stomach, colon, and funis.

How, then, may we know whether an infant has been born living or dead?

In many instances an autopsy will be imperative, provided other evidence, as that of an attending physician, is not at hand.

There are certain points in the *external inspection* of a new-born child which are of special importance in settling the question of its *maturity*, and this question of maturity may become the vital point at issue in a court of justice. It is therefore best to take note of every point, and while our decision may not be made up from any one alone, every item lends weight to the general result.

The following points, then, should be noted in the case of each new-born child found dead and coming to the notice of a medical examiner:

Weight. From such statistics as I have been able to collect, I find that the average weight of the new-born child at maturity is somewhat greater in the United States than it is in England and upon the continent of Europe.

Casper gives the weight of 247 cases as follows: —

Average weight, 247 infants	3309 grams.
Average weight of 130 males	3442 grams.
Average weight of 117 females	3192 grams.

The observations of Elsässer, Clark, Quetelet, Lecieux, and others give slight variations from these figures, none of them being quite as large as those of Casper.

Orth states the weight as 3300 grams for males, and 3250 for females.

The statistics of American-born children thus far obtained are meagre

[1] Blackstone, vol. i., page 129.

[2] 15 Pickering's Reports, page 255.

in the extreme. Dr. Burwell makes the following observation on 200 infants in the Philadelphia Hospital: —

100 males, average weight	3515 grams.
100 females, average weight	2961 grams.

Dr. Metcalf, of Mendon, gives the weight of 302 infants as follows: —

Average weight	3685 grams.
Average weight of males	3798 grams.
Average weight of females	3515 grams.

Through the kindness and assistance of members of the Middlesex East Medical Society I am enabled to give the weight of 203 infants born in that district: —

Average weight of 205 infants	3762 grams.
Average weight of males	3903 grams.
Average weight of females	3584 grams.

From various sources and not a very large aggregate of observations, I find an average for all classes in the United States to be about

3525 grams as an average for both sexes.
3650 grams as an average for males.
3400 grams as an average for females.

In London, from an average of 20,000 observations, Dr. Guy gives 3033 grams as the general average.

It is evident that the weight and also the length of new-born infants at maturity are influenced by various conditions, such as race, climate, and social standing. Most of the recorded statistics of foreign observers were compiled from observations made in maternity and lying-in hospitals in crowded cities, among a class of people considerably below the average social condition of the population at large.

The observations which I have quoted from Dr. Metcalf and the Middlesex East Medical Society were made in private practice in country and suburban villages, among a population of farmers, mechanics, laborers, and business men, representing a higher average class than the infants born in lying-in hospitals of large cities.

Length. The length of new-born infants at maturity presents but little variation. Caspar's measurements are: —

Average length of 247 infants	49.2 centimetres.
Average length of 130 males	51.8 centimetres.
Average length of 117 females	48.7 centimetres.

Dr. Burwell, of Philadelphia, gives the following: —

Average of 100 males	48.5 centimetres.
Average of 100 females	47.6 centimetres.

My own observations on this point are limited to seventeen mature infants, with this result: —

General average	49.9 centimetres.
Average of males	$50\frac{1}{3}$ centimetres.
Average of females	49 centimetres.

Here, then, is an open field of investigation, hitherto but little cultivated among American physicians, one which legitimately belongs to

a medico-legal organization. Combining, as we do, the offices of obstetricians and medical examiners, scattered throughout the State, we are thus able to collect vital statistics, and to disseminate them through the medium of this society. Let me therefore earnestly recommend to you, as medical examiners, the habit of carefully observing these points, which at first thought appear of trivial and minor importance, but which the foremost forensic physicians of the Old World have carefully observed and recorded in thousands of cases. And I beg leave also to suggest that you take your observations, as soon after the birth as possible, upon the naked child. Your record will then have the merit of accuracy, and you will be spared the trouble of mentally subtracting the estimated weight of a mass of swaddling-bands and other paraphernalia to obtain the net weight of the child.

The *circumference of the thorax*, the *diameters of the cranium*, longitudinal, transverse, and oblique (occipito-mental), and the *size of the fontanelles* add weight to the former measurements.

The *condition and color of the skin* should be observed, whether firm or wrinkled, peeling in flakes, putrid, red, white, purple, or greenish. The scaling of the skin which takes place during the first few days after birth, usually beginning on the abdomen and spreading to other parts, is a vital phenomenon and a proof of live birth. It should be distinguished from the peeling produced by maceration.

Ecchymoses and post-mortem discolorations should be noted, and incised to determine the condition of the blood contained in them. The coverings or wrappings of the child, if any are present; marks of cords, bands, cloths, or violence of any sort; vernix caseosa, meconium, or fæcal stains, all require attention.

The following particulars are also worthy of note: —

The length and condition of the hair upon the scalp.

The condition of the eyes, absence or presence of the pupillary membrane. The condition of the eyeball, whether firm, flabby, opaque, or of a condition well described as buttery.

The condition of the cartilages of the nose and ears, and presence of foreign material in either, or in the cavity of the mouth.

The absence or presence of finger and toe nails, and their comparative length if present.

The condition of the scrotum, and position of the testicles in males and of the labia majora in females.

Of all *external conditions*, there is none more suggestive in its bearing upon our subject than that of the umbilical cord. Its absence or presence should be noted, and, if present, its condition of consistence, and whether it be desiccated or putrefied, moist or dry, cut or torn, tied or not tied, its length, and its coverings. If the funis is not present, the condition of the umbilicus, as to complete or incomplete cicatrization, suppuration, or hæmorrhage, is to be observed.

Various opinions have been held as to the desiccation or mummification of the cord in living infants. Some writers hold that it is a vital process. Doubtless, the separation of the cord at its proximal end, attended with suppuration and subsequent cicatrization of the umbilicus, is a vital process, but the vitality of any process beyond this point where circulation has ceased is a matter of doubt.

Billard states that desiccation is a vital process, and makes the following conclusions: [1] —

"(1.) Desiccation of the funis cannot take place except during life.

"(2.) At the period of death, desiccation is suspended or retarded.

"(3.) If the cord be fresh or shrinking, the infant may have been still-born, or have lived but a short time.

"(4.) If the cord has already exhibited the beginning of desiccation, or is completely dry, the infant has lived at least one day.

"In general, putrefaction of the cord does not begin till after the decomposition of other parts of the body, so that it is not found putrefied, unless the walls of the abdomen are green and all parts of the body are evidently in a state of putrefaction.

"The separation of the cord is by suppuration, or a process similar to that by which the stem of some fruits is separated."

Heat and moisture play an important part in the changes of the cord, whether upon the living or the dead infant. The influence of the temperature of the living infant upon the cord is a matter which, though neglected by most observers in forensic medicine, is worthy of notice. This temperature (37° C.) is much above that of the average temperature in which dead infants are usually found, except in hot summer days and in hot climates. The condition of the cord of dead infants varies with the surrounding temperature and other conditions. The bodies of such infants are found in all sorts of conditions: in solid, fluid, and semi-fluid media, in hot and cold weather, frozen or thawed, in the earth and out of it. The cord of a child which has been floating in a stream for several days in November will not present the same appearances as one which has been left dry for several days in an open pasture in a July sun.

For the purpose of noting some of these changes, I selected six pieces from a fresh umbilical cord on the 26th of December last. This cord was of an average size. The pieces were of equal length, six centimetres, and each weighed five and one third grams. They were exposed as follows: —

Three were laid in shallow capsules, and exposed in a dry condition, and marked *a*, *b*, and *c*.

Three were placed in open glasses filled with water, and marked *d*, *e*, and *f*.

A and *d* were kept at a temperature averaging about 0° C., *d* being

[1] Traité des Maladies des Enfants, chapter on Umbilical Cord.

occasionally covered with a film of ice; *d* and *e* were kept at an average temperature of 15° to 17° C.; *c* and *f* were kept at an average temperature of 37° to 39° C., a little above that of the human body.

(*a.*) At the end of forty-eight hours slight shrinking of size was first noticed in *a*. In seventy-two hours it had shrunk one fourth its size, and showed signs of desiccation. At the end of the first week it had shrunk two thirds of its size. At the end of the second week its weight was only forty-three centigrams, one thirteenth of its original size, and was dry, hard, odorless, translucent, and showing the tortuous course of the umbilical vessels with hardened blood in them. This appearance it still retains.

(*b.*) Shrinking was noticed in *b* in thirty hours, desiccation also during the second day, and at the end of the first week it had dried and assumed the same appearance which *a* showed at the end of two weeks, its weight then and now being forty-five centigrams.

(*c.*) Shrinking was first noticed in *c* at the end of ten hours, and in forty-eight hours desiccation was completed, it having then assumed its present size and weight of forty-six centigrams.

(*d.*) At the end of twelve hours, *d* had swollen a little in size by imbibition of water. Its color was unchanged. A thin film of ice had formed over it. It was odorless, and remained so at the end of four weeks, still retaining the same appearance as at the end of twelve hours. There was no discoloration of the water.

(*e.*) The fragment marked *e* had swollen like *d* in twelve hours. There was an odor of putrescence at the end of the fourth day, and the water had become discolored with blood. This cord has retained its shape up to the present time, and the blood-vessels can still be seen at the ends of the cord. A pellicle of mold had formed over the water, containing organic *débris* and abundant infusoria. A stream of fresh water directed forcibly against this cord did not affect its shape at the end of four weeks.

(*f.*) A putrescent odor was decidedly manifest in *f* at the end of twelve hours, and the water was also discolored with blood. At the end of two weeks its shape was still unchanged. In three weeks the gelatinous envelope had fallen away from the blood-vessels, leaving them like long strings. In four weeks the whole mass was disorganized, leaving only a few bits of blood-vessels here and there retaining their original shape.

I have introduced these observations to show that desiccation *may* take place apart from the living body. The presence of the living body hastens desiccation by its high temperature. These observations do not affect the question of still or living birth so much as the questions, How long did this child live? and, How long has it been dead?

Before making the internal examination, the condition of the inferior femoral epiphysis should be noted, the knee-joint being opened, the epiphysis exposed, and thin transverse slices made through the epiphy-

sis until the widest part of the point of ossification is reached, provided such a point be found.

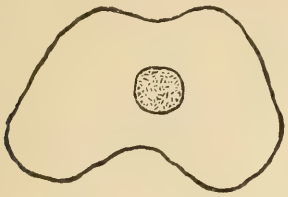

FIG. 1. A transverse section of inferior epiphysis of left femur at maturity.

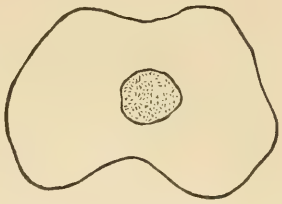

FIG. 2. Section of inferior epiphysis of left femur at age of two weeks.[1]

Casper lays down the following rule: "An osseous nucleus of three Rhenish lines (about six millimetres) in diameter permits the deduction that the child has lived after its birth." But few exceptions to this rule are likely to arise, and any that may occur may be tested by the hydrostatic test. The reverse of this rule, however, does not hold good, namely, that an osseous nucleus of less than six millimetres in diameter does not prove that the child was still-born. Previous to the thirty-seventh week of pregnancy the nucleus is not present.

This test, first proposed by Beclard in 1819, is now well established, and should always be taken, especially in doubtful cases. In addition to this, I will allude briefly to another test lately proposed by Dr. Wreden, of St. Petersburg, and verified by Dr. Ogston, of Scotland, by dissections of fifteen infants. They state that the middle ear is filled with a gelatinous substance up to the time of birth, this substance disappearing and giving place to air shortly after birth, but not in less than twelve hours. Hence they infer that air in the tympanic cavity is a sign of live birth.

If, upon the preceding inspection of the body, the medical examiner shall determine that it is not that of a viable infant, it will not be necessary to proceed farther.

In examining the internal organs, in order to come to a decision in regard to the question of living or still birth, we may conveniently group them as follows: the respiratory organs, the circulatory organs, the abdominal organs.

The Prussian criminal code, in its regulations for the conducting of autopsies upon new-born children, directs that the abdomen shall be laid open before any other cavities.[2] This gives an opportunity to examine the *diaphragm*, which in infants who have never breathed will be found highly arched (as high as the fourth intercostal space). In infants which have breathed it will not be found above the fifth intercostal space. Deviations from this rule are rare, and hence its value as a diagnostic sign. It should, however, be stated that transitory respiration may modify its value, and the diaphragm may occasionally be forced upward or downward by the accumulation of gas in the abdomen or the thorax.

[1] See Case 21, Records of Corresponding Secretary.

[2] Casper, vol. i., page 92.

The *thorax.* The external measurements of the thorax once ordered by the Prussian code are no longer required. These measurements were suggested by the observations of Daniel, who proposed them as a test, but the more careful observations of Casper and Elsässer show that the vaulting of the thorax is of not the slightest diagnostic value.

The *lungs:* their *situation.* This should be especially noted. If there has been no respiration, they will occupy the upper and posterior part of the pleural cavity, covering but little of the pericardium or diaphragm. If respiration has been full and free in a mature and healthy child, the lungs will be found to fill the pleural cavities, and cover the pericardium in proportion to the vigor and continuance of respiration.

Shape. Lungs which have not respired have sharp edges, while the edges of those which have respired are full and rounded, the gradations in shape depending on the freedom of respiration.

Volume. Before birth the lungs are comparatively small, and their increase in volume depends on the completeness and continuance of respiration.

I do not find any data relating to the absolute or relative volume of the lungs of new-born children as proposed by Daniel. Here, then, is an open field also for investigation, and I would urge that medical examiners make observations on every case of the newly-born, noting the volume of the lungs as determined by displacement of water, and comparing the result with some other measurement, as the length or weight of the child, or, more correctly, its volume. Possibly some definite *relative* standard may thus be obtained. The establishment of an absolute standard, either for the still-born or the living, can hardly be attainable, since it is not reasonable that the lungs of a mature infant, weighing three kilograms, should displace as much water as those of an infant weighing twice as much, under like circumstances.

Color. The color of a lung which has not respired is variously stated by different observers. Beck states it correctly when he says it is brownish-red, resembling the color of an adult liver, but incorrectly when he compares it with the color of the thymus gland. My own dissections find it brownish-red, a little redder than adult liver, not so dark as the fœtal liver, and much darker than the thymus. Gray, in his anatomy, gives the color of the thymus as pinkish-gray. Billard is more correct than Devergie when he states the color of the fœtal lung as exceedingly various, the latter attributing a uniform color to all fœtal lungs. Casper gives the color in general as reddish-brown liver color, with a brighter red at the margins. He also gives the color of infant lungs which have respired as of a dark bluish-red ground color, with bright red circumscribed insular patches, while just as often the bright cinnabar-red forms the ground color, and the dark bluish-red the insular patches. He deduces the following rule: "*It is consistent with experience that every insular marbling of the lungs excludes the idea of a*

fœtal condition," and entitles us *to assume as certain the fact of the child having lived after its birth.* The hydrostatic test should be resorted to as supplementary proof.

Two causes may modify the color of the lungs of new-born infants: pulmonary hyperæmia and artificial inflation. If the former have been the cause of death, the lungs will be found to have a dark red color, with bright red patches, bearing a deceptive resemblance to fœtal lungs.

In the latter case, if artificial inflation be successfully performed, the lungs will become spongy and assume a bright crab-red color, which is uniformly extended through their tissue without insular marblings.

Lungs advanced in putrefaction, and also those of children who have died from hæmorrhage, cannot be confounded with fœtal lungs.

If the lungs of a new-born child be inflated by blowing through its mouth, an imperfect expansion may sometimes be produced, which in color will resemble that of perfect respiration; but the change in color only takes place in portions of the lung. Hence we may more easily distinguish between *perfect* respiration and artificial inflation than between *imperfect* respiration and artificial inflation.

The bright color of the fully inflated lung, when artificially done, is not due to the accession of blood into its tissue so much as to the change in refractive power, due to the expansion and thinning of its cell walls, — a change such as may be seen during the inflation of a child's india-rubber balloon.

The action of the *air outside of the lung*, when admitted into the thorax at an autopsy, may change the color to a brighter hue. Hence the color of the lungs should be the first point to be noted in opening the thorax.

In this connection it may not be unworthy of observation that freedom from color-blindness is a matter of as great importance to a medical examiner as to a railway or marine official. It is chiefly on account of the necessity for a due regard to color in pathological appearances that the Prussian code forbids an autopsy by artificial light,[1] and although we are not governed by rigid rules we should doubtless profit by adopting a similar precept.

Consistence. Before respiration the lungs are firm and dense, like the liver, or nearly so. After respiration they feel soft and spongy, and are crepitant. In imperfect respiration, or even in artificial inflation, some parts may be firm and dense, others soft and crepitant.

Suffocatory hyperæmia and the results of *pneumonia* may modify this consistence, the lungs being dark in color, compact in tissue, not crepitant, more yielding to pressure than fœtal lungs, and generally capable of floating in water.

[1] Prussian Regulations for Medico-Legal Examinations, General Directions, § 6. Scotch Regulations for Medical Inspectors. General Duties, § 8.

Casper rejects the use of the word atalectasis as unscientific, saying, "The opinion which would elevate this atalectasis into a peculiar disease of the new-born child cannot for a moment be justified." He says also, "I am sure practical men will agree with me that the so-called atalectasis is a mere word, without any real significance" (being employed to designate two conditions, — a fœtal and a diseased, a physiological and a pathological, condition).

Weight. Nearly one hundred years since, Ploucquet proposed that the absolute and the relative weight of the lungs should be taken as a test of live or still birth, supporting his proposition by observations on three children. It seems remarkable that an observer making any pretense to scientific attainments should have attempted to deduce a theory from such a handful of facts, and still more remarkable that an error so gross should have held its ground through nearly a century of treatises and text-books on forensic medicine.[1]

I think the careful observer will agree with Casper in his conclusions from the examination of eighty-nine cases of lungs of new-born infants, and from those of Schmitt, Devergie, Elsässer, and Samson in as many more, that "*Ploucquet's test ought to be at once and forever struck out from the list of means employed to prove that respiration has existed.*" The criticism of this foremost of forensic physicians is a just rebuke to all superficial modes of observation.

We come now to a consideration of the hydrostatic test, or *docimasia pulmonalis*, a portion of our subject which has for many years been a battle-ground in forensic medicine.

A lung containing air is specifically lighter than water. A fœtal lung is specifically heavier. Therefore, that one must float and the other sink in water cannot be disputed. But it has been denied that their floating is due to their having been filled with air, or that their sinking proves their fœtal condition.

Objections to the test have been made as follows: —

First, that the lungs of a still-born child may float in water from the following causes: —

(I.) Artificial inflation.

(II.) Spontaneous emphysema.

(III.) Gaseous products of putrefaction.

(I.) *Artificial inflation.* I have already alluded to this subject under that of color, an artificially inflated lung being of a bright crab-red, without a trace of mottling. Elsässer's experiments confirm the statement that the stomach and intestines are often inflated in attempts at artificial inflation. The only mode of artificial inflation which would be likely to come to the official notice of the medical examiner is that of mouth to mouth, and that method is the least likely to succeed, al-

[1] Beck, vol. i., eleventh edition, pages 535, 536. "If the weight of the lungs be 1000 grains and upward, and if their weight compared with that of the body be as 1:40."

though it is occasionally successful so far as simple partial inflation is concerned, without resuscitation.

Lungs which have respired contain more blood, and hence are generally darker in hue than artificially inflated lungs. The latter have air forced into their tissue without blood, and this sometimes so forcibly as to rupture the air cells and produce a condition known as *hyperœria.* They may be distinguished from lungs which have respired by incising into their substance. If they have not respired they will not give vent to bloody froth under pressure. Hence Casper's conclusion that "*when we find a sound of crepitation without escape of bloody froth on incision, laceration of pulmonary cells with hyperœria, bright cinnabar-red color without marbling, and perhaps air in the stomach and intestines, we may with certainty conclude that the lungs have been artificially inflated.*"

In this connection I beg leave to introduce two statements which have some medico-legal significance. In a published lecture by the late esteemed Dr. Buckingham, he says, in regard to the resuscitation of asphyxiated infants, "Apply your mouth to that of the child, and try to inflate the lungs; *you need not fear that you will blow too hard.*"[1]

On the other hand, in the writings of Eberle I find the following incident related with remarkable honesty and candor: "A few years ago I attended a lady in a tedious and rather difficult labor. The child was still-born, but I nevertheless made some effort at resuscitation. I inflated the lungs in the usual way. The child, however, did not recover. A singular swelling just above the middle of the left clavicle induced me to examine it with the scalpel. The tumor extended into the thorax, in following which I opened the chest. On raising the sternum I found the superior portion of the left lung in a complete state of emphysema, and a good deal of air diffused under the anterior and lateral surface of the pulmonary pleura. With the exception of the inferior portions both lungs were crepitous, and appeared to have been well inflated. That the emphysema was the result of rupture of air cells, caused by the forcible inflation, and not of putrefactive decomposition, I could not doubt, for the child's motions were distinctly felt, both by the mother and myself, up to within two hours of the termination of labor."

(II.) *Spontaneous* or *Congenital Emphysema.* This condition can hardly be said to have been clearly proved in any single case, unless those of Chaussier may be termed emphysema. But in his cases, which were apparently the effect of severe and artificial labor, the presence of an experienced obstetrician is implied, which would exclude them from the domain of the medical examiner.

Schmitt's case is doubtless one of putrefaction; so also that of Meyn; while in that of Michaelis there is no reasonable evidence that the child

[1] Boston Medical and Surgical Journal, 1875, page 188.

was still-born. In addition to these cases, Casper in his late editions gives special notice to that of Hecker, in which both lungs floated in water, without a trace of putrescence. This case is one of the most noteworthy on record, as being one where all the conditions of intra-uterine respiration were present, namely, an early rupture of the membranes, a tedious labor, and frequent examinations of the os uteri, thereby admitting air freely to the womb.[1]

After a careful review of all these cases, Casper cautiously lays down the following principle as a modification of a previous one: "*That not one single, well-observed, and incontestable case of emphysema, developing itself spontaneously within the lungs of a fœtus born without artificial assistance, is known; and it is not therefore permissible in forensic practice to ascribe the buoyancy of the lungs of new-born children brought forth in secrecy and without artificial assistance to this cause.*"

(III.) *Putrescence.* It cannot be denied that fœtal lungs may become buoyant from this cause, but it is also true that the diagnosis between the appearance of lungs that have breathed and those in which gas is developed by putrescence is a matter presenting little difficulty to an expert.

In the first place, observation shows that the lungs resist putrefaction longer than the brain, the liver, the spleen, the stomach, or the intestines. If, then, putrescence is not present in these organs, we may infer that the floating of the lungs is not due to this cause. The phenomena of putrescence begin by the appearance of gaseous vesicles or bullæ of small size on the serous surface of the lungs. These are followed at a later period by a loss of lustre in the serous covering and a dark gray color, with putrid odor. The more advanced the stage of decomposition the more difficult is the process of distinguishing between fœtal lungs and those which have respired, when both have become buoyant from putrescence.

In one of my own cases (VII.) the right lung was found to fill the pleural cavity, the left not so completely; the right was bright red, the left reddish-purple; both were crepitant, and studded with bullæ of decomposition on their serous surface. These vesicles were carefully punctured, and the lungs readily floated in water. In this case the brain had entirely disappeared, and the stomach and a portion of the intestines had become an undistinguishable mass.

In this connection the experiments of a recent Italian observer, Professor Giovanardi, are worthy of note. His conclusions are as follows: —

(1.) The lungs of a child which has breathed sink in water if allowed to remain eleven or twelve days immersed in it.

(2.) When the entire body of a child which has breathed is placed

[1] For other cases of vagitus uterinus, see Edinburgh Medical and Surgical Journal, vol. xxxiii., page 215, and London Lancet, July, 1834.

in water, the chest being closed, the lungs will continue to float up to their entire destruction by putrefaction. When the cavity of the chest is opened so that the water may have free access to the lungs, the lungs will sink after fifteen or twenty days' immersion of the body.

(3.) When the body of a new-born child is found cut to pieces, the chest opened, and the lungs exposed (to the action of water?), an expert must not infer that the child has not breathed because the lungs sink in water.

(4.) By drying the lungs, an expert may determine whether the sinking in water is due to their *not* having breathed. If they have breathed and have been several days immersed in water, they will float after drying. If they have not breathed, they will in the dried state again sink.

(5.) In reference to this condition, an expert may sometimes form an approximate judgment of the time which has elapsed since the death of the new-born child. Spontaneous submersion takes place in eleven to fifteen days, and some days earlier if breathing has been imperfect, or if the lungs are cut in pieces, or are in a putrefied state.[1]

It should be stated that these conclusions appear to be derived from observations on five cases only, and are therefore not well enough established to be admitted as principles in forensic practice. Professor Giovanardi promises another paper based on more extended observations.

Having noticed those objections which relate to the floating of unrespired lungs, let us briefly consider the opposite class, those which relate to the sinking of lungs which have respired. Lungs of a new-born child which have once breathed may sink from the following causes: —

(I.) *Imperfect Respiration.* In a case of this sort some portions of the lung will be found to float, if it be cut to pieces and each part be tested.

(II.) *Suffocatory Hyperœmia and Hepatization.* In both these instances, as before, some fragments will be found to float. If incisions be made into the lungs and they be deprived of their blood by pressure, they may be made to float, while no amount of pressure will make fœtal lungs float. The incisions should be made beneath the surface of the water, and in the case of lungs which have breathed air bubbles will be disengaged and rise to the surface.

Cases of either sort, however, are so rare that but a few isolated instances can be found recorded among the writings of forensic physicians of the largest experience.

Evidence derived from the Circulatory Organs. The closure and obliteration of the foramen ovale, the ductus arteriosus, the ductus venosus, and the umbilical vessels are facts of greater interest to the phys-

[1] Rivista sperimentale de Med. legale, 1877.

iologist than to the medical examiner, since some of these ducts, if not all, must of necessity be found pervious in all new-born infants. Their closure usually takes place in from one day to three weeks or more, and generally in the following order: first the umbilical vessels, then the ductus venosus, the ductus arteriosus, and lastly the foramen ovale. In accordance with these facts, the examination of these vessels at the medico-legal dissecting table is no longer required by the Prussian code.

Almost the only inference of value which can be drawn from them is as follows: if they be found closed, the child has probably been born alive, but their patent condition is no proof that it was born dead.

Abdominal and Pelvic Organs. It is hardly worth noticing that the full bladder and rectum were once held as proof of still-birth. But even the most careless observer must know that both may be evacuated into the liquor amnii before birth. We should not, however, neglect an examination of these organs, and the same should be said of the stomach and colon. The presence of starch, sugar, milk, and other foreign material in the stomach, and of any fæcal matter other than meconium in the colon, would lend weight to the hydrostatic test in establishing the fact of live birth.

Both the absolute and the relative weight of the liver have been proposed as tests of live and still birth, based upon the fact of its decrease in weight after the birth of the child. But the diminution in size is so gradual and the variations in absolute size so great, as shown by the observations of Professors Bernt, Elsässer, and Orfila, that no reliance can be placed upon it as a test. Both the Prussian and the Austrian regulations ignore it, and Casper condemns it as unworthy of the slightest consideration.

In conclusion, the medical examiner may infer that a child has lived during and after its birth: —

(1.) When the diaphragm reaches only to the fifth intercostal space.

(2.) When the lungs more or less completely fill the thorax.

(3.) When the ground color of the lungs is broken by insular marblings.

(4.) When, by careful experiment, the lungs are found to be capable of floating.

(5.) When a bloody froth exudes from the cut surfaces of the lung on slight pressure.

(6.) When the air cells are visible to the naked eye.

These proofs, complete as they are, may be strengthened by the cicatrization of the umbilicus, the scaling of the epidermis, the closure of the fœtal ducts, the size of the osseous nucleus of the inferior femoral epiphysis, the existence of milk, sugar, starch, or medicines in the stomach, determined by the appropriate chemical tests, and by the presence f fæcal matter other than meconium in the lower intestines.

THE ANATOMICAL CHANGES CAUSED BY SEPTICÆMIA AND PYÆMIA.[1]

BY E. G. CUTLER, M. D.,
Associate Member.

SEPTICÆMIA is a disease caused by changes in the blood, resulting from the absorption of the products of decomposition. The anatomical appearances after death are as follows: Decomposition is seen to commence a very few hours after death, and goes on with great rapidity.[2] Rigor mortis is frequently absent, yet we occasionally find it when all the other signs of decomposition are marked. The skin has a peculiar reddish-brown color, and punctiform hæmorrhages with petechiæ are occasionally present. The abdominal wall becomes of a greenish color very soon after death, livid spots appear early, and sometimes emphysema is met with, which may be diffused throughout all the organs. Imbibition of the skin also appears in the course of the veins. The muscles are flabby and dark colored, and on microscopic examination we may often see a fine granular degeneration of the single muscular fibrils.

A microscopic examination of the *blood* shows that many of the corpuscles are destroyed, and that the serum is stained by their coloring matter; it is therefore thin, brownish, it has lost its power of reddening on exposure to air,[3] it rapidly discolors the tissues, and all the coagula are usually loose and flabby. Vogel,[4] Scherer, and others have found it to have an acid reaction. Bacteria have been observed in the blood,[5] but Orth[6] and Birch-Hirschfeld[7] say that their appearance is not constant, a circumstance which is explained by Koch[8] on the ground of the use of inefficient methods of examination. Bubbles of gas may sometimes be found in the blood.

The *heart* is flabby, anæmic, soft, and on microscopic examination very fine fat drops are seen in the muscular fibrils, while in the highest

[1] Read before the Massachusetts Medico-Legal Society, June 10, 1879.

[2] Birch-Hirschfeld has seen the greatest part of the body turn green within twelve hours after death in summer. Lehrbuch der pathologischen Anatomie, page 1227.

[3] Vogel. Handbuch der speciellen Pathologie und Therapie. Virchow, Band i., page 456.

[4] Loc. cit.

[5] Collman von Schatteburg. Jahresbericht für dem Jahre 1875, i., page 369. Virchow und Hirsch. Pasteur. Bulletin de l'Académie de Médecine, 1878. Allgemeine medicinische Central-Zeitung, February 1, 1879.

[6] Compendium der pathologischen anatomischen Diagnostik.

[7] Loc. cit.

[8] Wundinfectionskrankheiten, Leipzig, 1878.

degrees of this degeneration the striæ are lost. The color of the heart is pale yellow, and on section the knife becomes covered with a layer of fat.[1] This appearance, however, is sometimes absent in those cases where the parenchymatous degeneration of other organs is pronounced. There are frequently ecchymoses under the endocardium, especially in the left ventricle,[2] and the endocardium, as well as the intima of the blood-vessels, shows imbibition of the blood coloring matter. The fluid found in the pericardium and pleuræ is rarely colorless, but is usually stained with blood. The pulmonary surface of the pleura is often covered with numerous ecchymoses, the bronchial mucous membrane stained, the secretion colored with blood, and the lungs œdematous, or sometimes strewn with ecchymoses.

Usually the *peritoneal sac* contains but a small quantity of serous reddish fluid; the intestines are greatly distended with gas, and their walls may be infiltrated with serum when there is a considerable amount of exudation in the peritonæum.[3] Hyperæmia of the mucous membrane of the stomach may be found with swelling of the follicles; this hyperæmia may extend into the intestine, and be accompanied by swelling of the solitary glands and Peyer's patches; and there may be submucous punctiform hæmorrhages, while the contents of the gut are mixed with shreds of epithelium; or, in more severe cases, the intestine may contain blood.[4] The mesenteric glands are usually swollen and hyperæmic.

The *spleen* is large, flabby; the parenchyma is unusually soft, and may be even of a pulpy consistency; the color is mostly dark cherry-red or chocolate; the trabeculæ of the stroma are hidden by the swollen pulp; the Malpighian follicles are usually not sharply defined, but are indistinct, or may be hyperplastic. Sometimes, also, numerous hæmorrhages are seen standing in small groups, which are distinguished from the rest of the splenic tissue as black-red points.

In the *liver* we may distinguish the different stages of parenchymatous degeneration, and trace it from the commencing cloudy swelling of the hepatic cells up to a complete destruction of them.

The *kidneys* are ordinarily more or less swollen; the cortex exhibits the same degeneration as the liver, the epithelium of the convoluted urinary tubules being in a condition of fatty degeneration, or perhaps having fallen in pieces. The mucous membrane of the bladder may sometimes be found to be in a catarrhal hyperæmic condition, especially in cases of childbirth, but it is usually healthy.

In the *central nervous system* hyperæmia of the membranes and gray matter of the brain may be met with, though it is usually normal.

After parturition or abortion, we may find the source of infection in the genital organs, a tear of the cervix or vagina, a foul endometritis,

[1] Winckel. Pathologie und Therapie des Wochenbettes, pages 206 and 318.

[2] Winckel. Loc. cit., page 318, etc.

[3] Winckel. Loc. cit., page 283.

[4] Birch-Hirschfeld. Loc. cit.

or a localized gangrenous spot. If the disease is of traumatic origin, there are usually diffuse, bloody, or ichorous infiltrations of varying extent and depth at the seat of injury.

Birch-Hirschfeld speaks of another class of cases, in which softened, putrid thrombi, arising from a focus of gangrene, are borne off in the circulation, and give rise to embolic gangrenous spots, usually situated in the lungs. In still another class of cases there may be an inflammation of the pleura, pericardium, or peritonæum. The amount of effusion is small, and the false membrane covering the surface is thin and delicate.

Pyæmia is a general infection, probably roused by specific organisms (bacteria), and starting from surfaces of wounds or the foci of primary purulent inflammation. It may be conveniently divided into three groups: —

(1.) Cases where there is an unexplained tendency to localization in the serous membranes, synovial membranes, and endocardium. We may say that the disease has a certain affinity to these membranes. Diffuse sero-purulent pleuritis, pericarditis, peritonitis, occurs without any local affection of the organs which these membranes cover; more rarely there is meningitis, purulent synovitis, or ulcerative endocarditis. The inflammation is apt to crop out in several serous membranes at the same time. This form is rare, however.

(2.) The second group includes those cases where the mucous membranes, and especially that of the digestive canal, are the parts chiefly affected. At the examination we find the appearances of simple catarrh of the small or large intestine, with accompanying swelling of both the solitary glands and Peyer's patches. We see in addition, not unfrequently, diphtheritic infiltration with the formation of sloughs, and a greater or less extensive loss of substance in the mucous membrane. These cases are also rare.

(3.) The third group comprises the most frequent forms of pyæmia, the pyæmia multiplex of Hueter, metastatic or embolic pyæmia. As a rule, there is venous thrombosis in the periphery of the original point of lesion; these thrombi do not become organized, but undergo softening, especially a foul softening, caused or favored by ichorous suppuration in the vicinity of the vein. Portions of these thrombi, swept away by the circulation, become wedged in the vessels of the lungs, and give rise to abscesses; and secondary thrombi may be borne thence, and produce emtastatic abscesses in the heart, spleen, liver, kidneys, etc.

The following are the chief post-mortem appearances found in the different organs: —

The *skin* is flabby and pale, sometimes intensely icteric. Sudamina are not uncommon, and their contents may be purulent.[1] Small vesi-

[1] Anstie. Lancet, January 22, 1870, page 117. Cameron. Lancet, July, 1878, page 65.

cles with a hæmorrhagic halo, pemphigus, hæmorrhagic spots with a yellow pustular centre,[1] and punctiform hæmorrhages [2] are recorded.[3] Leube [4] found a sphere of bacteria in an abscess cut out from the skin of a pyæmic patient just before death. Salmonsen [5] also found bacteria in abscesses of the joints in a living person, death taking place a few days later.

The *brain* and its membranes usually show no changes, yet œdematous swelling of the pia [6] is not very rare. Leube [7] met with injection of the membranes and minute extravasations of blood into the cortical substance of the brain. Waldeyer [8] and Leube [9] have observed purulent meningitis, and Braidwood [10] records metastatic abscesses of the brain. Abscesses of the brain were found recently in one of the cases at the City Hospital: they were small in size, not larger than a bean, and were situated in the cortex to the number of five or six.

Conjunctival hæmorrhages are mentioned by Leube,[11] and retinal hæmorrhages were also observed by him and by Litten.[12] Virchow [13] has found embolism of the retinal and choroidal vessels, and Meckel first described "pyæmic ophthalmia" in volume v., page 276, of the Charité-Annalen.

The *heart* is usually of normal consistency and color,[14] though Birch-Hirschfeld [15] says abscesses may be found in it in at least one third of the cases of metastatic pyæmia, on careful search. They begin as pale yellow lines or points, and a microscopic examination shows no pus, but an abundance of micrococci, single or in colonies, which frequently lie in the interior of vessels; or they may be discovered in the muscular fibrils.[16] After suppuration has occurred, the bacteria are difficult to find. Suppuration extends between the muscular fibrils, which fall to pieces, and may leave an abscess as large as a filbert. They usually form in the eft ventricle, but may be found in the right side,[17] or in the papillary muscles.[18] The granular and fatty degenerations of the muscular fibrils are not unfrequently met with,[19] and numerous instances of diphtheritic

1 Leube. Deutsches Archiv für klinische Medicin, October, 1878, page 244.

2 Charité Annalen, iii., page 191.

3 Gazette hebdomadaire, No. 46, 1868. Comegys. Philadelphia Medical Times, November 23, 1878.

4 Loc. cit. 5 Centralblatt für Chirurgie, No. 2, 1879.

6 Hueter. Allgemeine und specielle Chirurgie. Billroth und Pitha, page 70.

7 Loc. cit. 8 Virchow's Archiv, xl., page 401. 9 Loc. cit.

10 On Pyæmia or Suppurative Fever. London, 1868.

11 Loc. cit.

12 Charité-Annalen, iii., page 137. Gräfe's Archiv, xxiii. 2.

13 Archiv für pathologische Anatomie, Band ix., page 307 to 308.

14 Waldeyer, loc. cit.

15 Lehrbuch der pathologischen Anatomie, page 347.

16 Heiberg. Die puerperale und pyæmische Processe. 1873.

17 Heiberg. Loc. cit.

18 Purser, British Medical Journal, August, 1877.

19 Birch-Hirschfeld, loc. cit., and Archiv der Heilkunde, xiv., pages 193 to 241.

endocarditis are recorded.[1] The pericardium may be covered with a fibrino-purulent membrane, as a complication of the metastatic process; or, independent of it, there may be the diffuse pericarditis already alluded to.

The *blood* may be unchanged,[2] or there may be an increase in the number of the white corpuscles.[3] In a high degree of infection the white corpuscles may be very granular,[4] and bacteria are found in them.[5] In protracted cases the granular condition of the white corpuscles may be the only visible change in the blood (Birch-Hirschfeld). Laptschinsky [6] found that the red blood corpuscles did not form regular *rouleaux*, but heaps or clumps of various sizes and shapes. The single blood corpuscles often appeared swollen and a little cloudy, and their contours not as distinct as usual. Frequently, very small corpuscles, one third the normal size, were found, which were sometimes intensely colored, and sometimes very pale. Further, great irregularity in the shape has been observed. Leube [7] speaks of very numerous, small, irregularly shaped, whitish, highly refractive bodies, some of which at times moved very rapidly, and which were possibly bacteria. Bacteria have been seen by numerous observers both floating free in the serum and contained in the interior of the white corpuscles, as mentioned above.

In the *lungs* the most common change is the formation of metastatic abscesses; the lower lobe is the part usually affected, though the lower portion of the upper lobe is sometimes found to contain them. They are almost never seen in the apices.[8] They are either of the size of a bean or cherry,[9] or they are miliary. In the former case we are able to find an embolus in the pulmonary artery leading to the abscess; in the latter it is impossible to distinguish one, as the infecting substance has got into the circulation in a state of fine molecular subdivision. In the former case a combination with hæmorrhagic infarction is common. In both cases we may find bacteria within the capillaries, in the interlobular connective tissue, and in the alveoli, similar to those found at the surface of the wound and in the different secondary foci of other organs. Metastatic abscesses, both large and miliary, at first have a gray color, then they become yellow, and finally a cavity is formed with fluid puru-

[1] Heiberg, loc. cit. Beckmann, Virchow's Archiv, Band xii., 1857, page 61. Purser, loc. cit.

[2] Waldeyer, loc. cit. Hueter, loc. cit. Birch-Hirschfeld, Archiv der Heilkunde, xiv., 1873, page 210.

[3] Wagner, Handbuch der allgemeine Pathologie, 1874. Birch-Hirschfeld, Archiv de Heilkunde, 1873, page 210.

[4] Birch-Hirschfeld, loc. cit.

[5] Hueter, Allgemeine Chirurgie, Cop. xvii. Birch-Hirschfeld, loc. cit. Koch, Wundin fectionskrankheiten, Leipzig, 1878.

[6] Centralblatt für den medicinischen Wissenschaften, 1874, No. 42.

[7] Loc. cit. [8] Hueter, loc. cit.

[9] Orth, Compendium der pathologischen anatomischen Diagnostik, 1876, page 139, Herz, Ziemssen's Cyclopædia.

lent contents. In the periphery lobular pneumonia, due to irritation, often occurs, which sometimes terminates in softening; the abscess may thus perforate into the pleural sac or into a bronchus, both of which are rare.[1] A limited amount of œdema and injection is not uncommon. The bronchial mucous membrane is very frequently reddened, swollen, and covered with much secretion.

Changes in the *spleen* are by no means constant.[2] There may be splenic tumor, with hyperæmia and a very pulpy organ, such as is seen in septicæmia; or the consistency may be dense and the color pale. Indeed, there is sometimes an anæmic, pale yellow appearance, or a mottled look, from alternation of such pale places with hyperæmic ones. This is more especially true in protracted cases. In this hyperplastic condition the Malpighian follicles may be very ill defined; in other cases, on the contrary, they are very distinct, and evidently enlarged. On microscopic examination there is seen to be a diffuse granular cloudiness of the cells of the pulp, which may also contain micrococci, while the reticulum is found not to be increased. When metastatic abscesses are found, they are usually of the same size as those seen in the lungs, and the pus which they contain may be good, creamy, and without odor.[3] Micrococci may be observed at an early stage of the abscesses. Sometimes the spleen is found to be healthy.

Waldeyer[4] records that in twenty per cent. of his cases the *liver* was healthy. The more common changes were: (1.) Simple swelling without any degenerative processes. (2.) Simple fatty infiltration in the periphery of the acini, both diffuse and isolated. (3.) Granular and fatty degenerative cloudiness. (4.) Enlargement from retention of bile in the ducts, with or without degenerative processes. (5.) Abscesses.

Fatty infiltration in the territory of the portal vein is common to this with other diseases, and in its lighter grades is scarcely to be regarded as pathological. The most frequent change is the combination of swelling with granular cloudiness or fatty infiltration of the cells; this was observed in thirty per cent. of the cases examined. Degenerative cloudiness without swelling of the acini is very rare; it was found in only eight per cent. of the cases. Enlargement as the result of retention of bile was more common, and was always of catarrhal origin, a dense plug of mucus being detected in the intestinal portion of the ductus choledochus. Waldeyer also found at the same time with the swelling and degenerative processes a moderate increase of the connective tissue cells in the portal territory of the acini; it was never so great as to be distinguishable to the naked eye, however. Abscesses were seen in six per cent. of the cases, and as usual they were located in the right lobe.

[1] Birch-Hirschfeld, loc. cit.
[2] Waldeyer, loc. cit. Billroth, Archiv für klinische Chirurgie. Birch-Hirschfeld, loc. cit.
[3] Hueter, loc. cit. [4] Loc. cit.

The size of the abscesses may vary from that of a pea, or even smaller, to that of a child's head (which is rare). The absence or slight amount of hæmorrhagic infarction in metastatic abscesses of the liver is very characteristic.[1] At an early stage it consists of a group of gray or grayish-yellow acini, which are not unfrequently enlarged, and whose periphery is shaded off by a yellower tint; the consistency is still normal. Gradually the acini become colored more and more yellow, their boundaries are effaced, their consistency diminishes, and a small collection of pus is formed from them; this may unite with neighboring ones, again, and form a large abscess. All stages of this development may often be seen near each other. Microscopic sections of the first stages show considerable dilatation of the hepatic capillaries, and a consequent compression of the rows of hepatic cells. The capillaries are filled with micrococci, and contain a greater or less number of white blood corpuscles, and only a few red ones. In some places capillaries are found which are full of white corpuscles, having a highly granular protoplasm, and apparently containing micrococci; and it is not improbable that the white corpuscles import the micrococci, and are destroyed by their increase.[2] During the early stages we only find isolated pus cells outside the vessels; later, they increase in number, at first in the periphery of the acini, gradually extending inwards from the portal branches, and compressing the hepatic cells more and more, till at last they become completely atrophied. If suppuration is just beginning, we observe a large collection of round cells mixed with detritus, and here and there heaps of micrococci, but the process here has advanced so far as to render it impossible to follow the successive steps.

The changes in the *intestinal tract* are few. Hueter (loc. cit.) has observed stomatitis pseudo-membranacea on the tongue, in the whole cavity of the mouth, in the pharynx, and in the œsophagus, extending as far as the cardia in protracted cases of pyæmia. Swelling and cloudiness of the gastric and intestinal mucous membranes are not infrequent. Billroth [3] has found moderate swelling of the solitary follicles and Peyer's patches but rarely accompanied by hyperæmia. Waldeyer (loc. cit.) saw the mucous membrane in the pyloric portion of the stomach often considerably swollen and cloudy, with extension of the same change into the duodenum and upper part of the jejunum; the Brunner's glands of the duodenum swollen to the size of millet seeds, yellowish and cloudy; the entire mucous membrane of the stomach and intestine succulent, not rarely œdematous, and usually without ecchymoses or marked hyperæmia, even after profuse diarrhœa. He observed diphtheritic inflammation in the large intestine but once.

[1] Hueter, loc. cit.
[2] Birch-Hirschfeld, Koch, loc. cit.
[3] Archiv für Chirurgie, ii., pages 325–511.

Waldeyer[1] found that in the *lymph apparatus of the intestine and mesentery* the gross and microscopic appearances were those of a simple, ordinarily dense hyperplasia, sometimes with localized fatty degeneration marked by circumscribed yellowish spots on section of the glands. The mesenteric glands in the ileo-cæcal angle are distinguished from the others by their size. It is but seldom that they appear pulpy or juicy; in most cases they are dense, smooth on section, and have no points springing forth. In connection with this there is often a swelling of the lymphatic intestinal follicles, especially about the ileo-cæcal valve, not unfrequently accompanied by small ecchymoses.

Metastatic abscesses have been found in the *pancreas*, though rarely. (Birch-Hirschfeld.)

By far the most frequent change in the *kidneys* is a more or less considerable swelling, with great cloudiness and moderate fatty degeneration of the portions of convoluted tubules between the glomeruli and the looped tubules of Henle.[2] Eighty per cent. of the cases examined by Waldeyer gave this result. Much more infrequent are simple cloudiness without swelling, simple hyperæmia, and the normal appearance. The density of the kidneys is very variable; sometimes soon after death they are quite flabby and easily broken down, other evidences of cadaveric change being absent: sometimes they are decidedly firm and solid. The cloudiness is mostly of a grayish-yellow or bright yellow color, the tinge changing naturally very much with the amount of blood. Often when there is much swelling and cloudiness small ecchymoses and hæmorrhages into the urinary tubules are observed. Both kidneys are alike affected, and some degree of change is never absent when there is a considerable affection in other organs. The alterations correspond mostly with changes in the liver. Metastatic abscesses occur chiefly in the cortex (Birch-Hirschfeld), for the reason that the particles which excite the inflammation have got into the renal circulation in a very finely divided state, and therefore first become wedged in the capillaries of the cortex, or perhaps in the Malpighian bodies. If the particles, on the other hand, are larger, — for example, fragments of thrombi, — the abscesses are located between the pyramids corresponding to the distribution of the larger branches of the renal artery. In cases of the sort first described, the cortex is often interspersed with an enormous number of abscesses, which, on stripping off the capsule, appear on the surface of the kidney as round gray or yellow spots, often scarcely as large as the head of a pin, surrounded by an areola of injected vessels. If the process is not too old, especially in the smallest gray foci which are still firm, we may see in the centre of the thick purulent infiltration a vessel plugged with bacteria. Later, when the

[1] Virchow's Archiv, xl., page 405.
[2] Waldeyer, loc. cit.

spot has softened, it is no longer possible to find the parasites. Confluence of these small points forming large abscesses is rare, because the life of the patient is not sufficiently prolonged. The large metastatic abscesses in the pyramidal portion usually show the same striped form as that seen in interstitial purulent nephritis.[1]

The *uterus* is unchanged, except in those cases where it forms the starting-point of the disease. This usually occurs as a sequel to the puerperal process, and we find either a metrophlebitis or a metrolymphangitis. In the former case the metritis takes its point of departure from the location of the placenta, causing an ichorous decomposition of the thrombi in the placental veins; these thrombi may increase from here to the veins of the uterine wall, the plexus pampiniformis and the spermatic veins. As these thrombi undergo the same degeneration, they may be swept forth by the circulation and plug vessels in distant organs, giving rise to metastatic abscesses, just as in ordinary wounds. In the latter case the inner surface of the womb is covered with a foul-smelling, brownish slime; or, when this has been cast off, we find an extensive yellow layer consisting mostly of pus cells. In the cervical portion we see deep ulcers and fissures covered with discolored sloughs, and may often trace the advance of the inflammation into the deeper portions. Ordinarily the inflammation tends to spread in the intermuscular tissue, evidently following the lymphatics. The larger lymphatics appear as yellow stripes or round vessels, according to the direction of the section; their contents are purulent. The pus is not always confined to the interior of the lymphatics; a purulent infiltration may be found in the neighborhood, also, and a microscopic examination shows that there is an extensive infiltration of the intermuscular tissue by pus cells, and fine granular elements. The muscle cells are at the same time swollen and filled with dark granules. The inflammation is continuous from the uterine wall over into the pelvic connective tissue, and the lymphatics may be traced into the broad ligaments over the pelvis, or into the abdominal wall. The inflammation invades the peritonæum very early, and is seen at the sides of the uterus first. (Birch-Hirschfeld.)

Acute purulent myositis is of frequent occurrence. At first, an inflammatory œdema is found in the loose intermuscular connective tissue; the spaces between the muscles appear gray, then become brawny, and finally yellowish and purulent. In most cases of phlegmon the inflammation is confined to the intermuscular connective tissue, the perimysium appearing to afford a certain protection against the advance of the inflam-

[1] Abscess does not always follow when bacteria get into the renal vessels with the blood. They have sometimes been found in cases where we must assume that the parasites came from the blood, and yet where no metastatic renal abscesses were present. Orth, in Virchow's Archiv, lix., called attention to the fact that in many cases of pyæmia, where there were no renal abscesses, fine yellow lines were found in the points of the pyramids, which a microscopic examination proved were straight urinary tubules filled with micrococci.

mation, so that the muscle itself suffers only through injury to its nutrition. For a time, on cross section, the muscle is found to be divided up by yellow lines or bands of purulent infiltrated connective tissue. Later, the muscle is also changed: it becomes softer, paler, and more brittle; cloudy swelling and fatty degeneration occur; sometimes also a more or less extensive waxy degeneration; while the connective tissue of the muscle is thickly infiltrated with pus cells. It frequently happens that the inflammation does not invade the muscle *in continuo* from the infected spot, but that the myositis occurs in a remote place. This was very beautifully illustrated in a case at the City Hospital recently, the source of infection being the rectum, and the myositis appearing in the right rectus abdominis.

The *peritonitis* of pyæmia is usually of puerperal origin.[1]

When the *joints* are implicated, we find in some cases merely an increased amount of synovia; in other cases the contents are purulent. Sometimes, when pus is present, the synovial membrane and cartilage are uninjured; at other times there is complete disorganization, and the bones forming the joint are exposed and at times necrotic.[2] The inflammation is usually confined to the synovial membrane;[3] it is somewhat thickened and reddened, and the cartilage underneath may remain either unchanged, or become a little cloudy.[4]

A comparison of pyæmic pus with healthy pus[5] shows that the corpuscles of the former are of very variable size; their contour has lost sharpness and regularity; they often appear prickly or gnawed. Their protoplasm is at the same time darker, gray-blackish, and appears more coarsely granular than the cells of good pus. This granulation is finer than that caused by fat granules, and further may be readily distinguished from it chemically A further difference consists in the considerable formation of vacuoles, so that only a small ring of protoplasm is left in many cells. Birch-Hirschfeld considers that the granulation comes chiefly from the penetration of bacteria into the protoplasm, because, after addition of strong acetic acid and destruction of the cells, the granules insoluble in ether and caustic potash, bacteria, are strikingly more numerous in the serum. This pus is said to have a peculiar odor, different from that of decomposition.

[1] Bauer, Ziemssen's Cyclopædia.
[2] Bryant's Surgery.
[3] Holmes, System of Surgery.
[4] Hueter, loc. cit.
[5] Birch-Hirschfeld, Archiv für Heilkunde, 1873, xiv., page 193.

A MEDICO-LEGAL CASE OF ABORTION,

FOLLOWED BY CONVICTION OF THE ACCUSED ABORTIONIST.[1]

BY MEDICAL EXAMINER J. C. GLEASON, M. D.

In the afternoon of June 8, 1878, in response to a telegram from Dr. J. W. Spooner, I went to Hingham to view the body of Mrs. Rebecca H., a colored cook, living in the family of Mrs. B., in the west part of the town. I found the body of Mrs. H. in ordinary dress, lying upon a bed in an attic chamber, used as the sleeping apartment of the house servants.

I learned that, in apparently perfect health, the woman had gone up to this room at about eleven A. M. with a Dr. Gilson, of Boston, she carrying up with her a basin of warm water; that in twenty-five to thirty minutes he came hurriedly down-stairs for brandy; that servants procured it for him, and, accompanying him up-stairs, found Mrs. H. upon the floor dead. A tub containing a small quantity of bloody water was seen near by. This the doctor directed one of the servants to throw away. Another of the servants had, at a previous visit of the doctor, lent him a common rubber syringe, which had not been returned to its owner. A bottle containing tincture of aloes and myrrh was found in the room, and in the kitchen below another containing a small quantity of fluid extract of cotton root. Further search discovered the syringe concealed in a bureau which stood near the bed. When found it was *still wet.* To the discharge pipe of this syringe a strange nozzle was affixed, which bore evidence of having been filed off, though somewhat roughly, and which was found a few days later to fit quite well a female catheter which the jailer at Plymouth discovered as it dropped from its concealment upon the person of the prisoner at the time of his commitment, June 12th.

With the assistance of Dr. J. W. Spooner, I made an autopsy, with the following as the result, omitting, for the sake of brevity, any unnecessary details.

Time of autopsy, 9.30 P. M. to midnight, June 8, 1878. Place, the room above described.

[1] Read before the Massachusetts Medico-Legal Society, June 10, 1879.

The only external evidence of violence was fresh blood-staining of the under-clothing about the genital organs. The mouth of the womb was sufficiently dilated to admit easily the index finger. The unruptured membranes were felt through the neck of the organ by the examining finger. The uterus rose above the umbilicus to the height usual in the seventh month of pregnancy.

An incision was made from the neck to the pubes. The blood following this incision over the thorax was frothy. The heart and lungs were removed. When opened, the heart was found empty and healthy throughout; the vessels connected with it were also normal. The lungs were hyperæmic; color red; vessels distended; the air cells filled throughout with bloody serum. In the stomach, liver, spleen, intestines, and kidneys nothing abnormal was discovered.

The uterus, vagina, and bladder were removed together. The bladder, which was healthy, was first dissected off. I then opened the vagina along its anterior median line to the os uteri. The mucous membrane of its lower third was deeply reddened, and abraded in places. The mouth of the womb was patulous, reddened, and somewhat excoriated. The neck of the organ, two and a half centimetres (usual) in length, was dilated throughout sufficiently to admit the finger; its inner surface was reddened and free from all mucus. Following up the vaginal incision, I next opened the uterus to the fundus, carefully avoiding any injury to the membranes, which were as yet entire. On the *right* side, front and back of the organ, I found the membranes dissected up from the uterine wall to the extent of some two thirds to three fourths of their whole connection with the interior of the womb. The lining of the uterus, from which the membranes had been detached, was reddened, and scattered over its surface were seen a number of bright red loose clots of the size of a pea or bean. The placenta was involved in this separation, its right edge, to the depth of two and one half to two and three fourths centimetres, around one third to one half of its circumference, being detached, opening uterine sinuses. No clots protruded from these sinuses, nor was blood as a layer effused over any part of the interior of the organ. The remainder of the placenta and the membranes were normally adherent to the interior of the womb. The placenta was of usual size and appearance, attached to the fundus.

The amniotic sac contained a well-developed female fœtus, thirty-nine centimetres in length, and weighing fully one and one third kilograms, floating in a clear fluid, and having a fresh, healthy appearance. Presentation cephalic, with the back of the fœtus to the abdomen of the mother. The ovaries were enlarged, bound posteriorly to the tissues by adhesions; when opened they were found to contain cysts and a corpus luteum.

The brain was anæmic; nothing unusual further was observed on

careful examination of all its parts. The heart and kidneys were giveu on June 11th to Dr. R. H. Fitz for microscopic examination. The uterus and its appendages were transmitted at a later date to Dr. J. R. Chadwick.

On the 10th of June, an inquest by Justice Keith found Dr. Gilson guilty of attempted criminal abortion, causing the death of this woman. Two days later Gilson was indicted by the grand jury at Plymouth, and in default of bail was committed. The case came to trial in the superior court November 25, 1878. Pitman, judge; District Attorney French appearing for the State, Messrs. Pillsbury and Lord for the accused.

At the trial, servants testified to the fact of Mrs. H. taking both the aloes and myrrh and the cotton root, and to the various visits of the doctor upon her. The owner of the syringe identified the same, and testified that she had never before seen the strange nozzle. It was not in the box when she lent the syringe. To the defendant's excited efforts, in their presence, to resuscitate the woman; to the fact of his finally leaving her dead, telling the servants to say to any inquirers that Mrs. H. "died in a fit;" as well as to his direction to throw away the bloody water, there was ample testimony. It was in evidence that on the day before the death of Mrs. H. the doctor, in conversation with her mother and sister, to quiet their fears, told them that "he should not hurt Mrs. H. or kill her; she had only a slight trouble, and would be all right in a few days. She would not even have to go to bed."

As medical examiner, the writer detailed the manner and results of the autopsy, and testified that the appearances in the womb indicated that some force coming from without had with violence dissected up the membranes and edge of the placenta. Water or like fluid, alone or mixed with air, forcibly injected into the organ would cause the appearances seen at the autopsy. No evidence of disease was found, or cause of death other than the *uterine interference*. It is unsafe to inject any substance into the pregnant uterus. Air or gas, or any *liquid* containing the same, is especially liable to cause sudden death. Quite a number of fatal cases from this procedure have been reported of late. With this catheter [catheter and syringe shown] fitted to the filed nozzle which was found affixed to the syringe we should have an effective instrument for giving an intra-uterine douche. The catheter could be readily passed, going up between the membranes and the uterine wall, the discharge pipe of the syringe then being connected by means of this prepared nozzle, and the instrument is complete. The autopsy showed conclusively that there had been no considerable loss of blood, as there were no clots protruding from the sinuses, nor was blood effused over any portion of the interior of the uterus beneath the detached membranes. The death was undoubtedly instantaneous. If we assume

this syringe with catheter attached to have been the instrument used, *air* during its working (as will be shown later) could get in at the point of insertion of the nozzle (roughly filed) into the catheter, and also at the bulb, from some imperfection in the same.

Air forcibly injected into the uterus in the condition in which this was found might enter the circulation through the uterine sinuses, and cause instant death. In such cases the precise mechanism of the mode of death has been a matter of some dispute among pathologists. In the case of this woman, the post-mortem appearances indicated at least the very strong probability of death from air embolism. In the case of Mrs. H. it should have been easy to diagnose her pregnant condition at this period of its advancement. It was easily made out at the autopsy before opening the body. Pregnancy was uncomplicated, and the position of the fœtus was favorable to hearing the sounds of the fœtal heart.

The redness of the interior of the uterus, from which the membranes had been detached, was the result of the sudden and violent stripping off of the same from the lining beneath; it was of recent origin, as were also the excoriations.

In justifiable abortion the method of inducing uterine contractions by the use of the intra-uterine douche, known as Cohen's method, was advocated and practiced to some extent thirty years ago, but to-day is almost universally condemned on account of its danger. By the profession in general the use of such injections is now chiefly limited to cases of extreme flooding after delivery, and to cases of septicæmia. Physicians sometimes err in diagnosing pregnancy. In uncomplicated cases such mistakes are infrequent so late as the sixth or seventh month.

Dr. J. W. Spooner, who assisted at the autopsy, corroborated the testimony above given, stating it to be his opinion that death resulted from an interference within the pregnant womb. He believed it most probable that the occurrence of death was by air entering the uterine sinuses. He saw no evidence of any disease of the womb calling for treatment. Cotton root has a popular reputation as an abortive agent. Mrs. H. was from six to seven months advanced in pregnancy. He believed the fœtus lived up to the time of the mother's death.

Dr. J. R. Chadwick testified that in his opinion the death of this woman was clearly attributable to interference with the pregnant womb. In the organ itself there was no satisfactory evidence of the cause of death, but the conditions were such as to suggest the mode of its occurrence. The evidence derived from the autopsy shows that the membranes were not dissected up, as they usually are, by extravasations of blood behind them, as in ordinary cases of labor or spontaneous abortion, but something must have forced itself, or have been forced, between the uterine wall and the membranes. The evidence points to

something from without. If from without, it must have been a fluid, and have been impelled forcibly through a tube which had previously been passed well up into the uterine cavity. This alone can explain the manner and extent of the separation of the membranes, involving as it did the edge of the placenta. The injection of a fluid into the uterine cavity is further made probable by the fact that no blood was found extravasated between the detached membranes and the uterine wall, and no clots were protruding from the open ends of the uterine walls, both of which would indisputably have been discovered had they not been washed away.

The separation of the after-birth is a laceration of the walls of the sinuses [1] so that the cavities are opened. These sinuses communicate directly, by large arteries and veins, with the blood-vessels of the mother's body. The manner and suddenness of the death can be explained on one only of three theories: that the woman died (1) of shock, (2) of embolism, (3) of the entrance of a large volume of air into the blood-vessels.

(1.) Although authorities state that death from shock may result from uterine and vaginal injections, yet no reported cases are known to witness in which this is clearly made out; hence we are led to believe that the term shock, which is now used in many cases where no demonstrable cause of death is found at the autopsy, has been applied in instances which the more scientific pathology of the present day would show to have been due to embolism, or air in the veins.

(2.) Embolism. Death from this cause is very rarely instantaneous; if it occurs, it must result from an arrest of a clot at or near the heart, and would be disclosed by careful autopsy. Besides, days would be required to allow any coagula that might be found in the uterine veins to become so disintegrated as to be taken up by the blood and carried forward toward the heart.

(3.) The entrance of air into the blood-vessels has been shown to have occurred in very many instances, and to have caused instant death. Many theories have been advanced to account for this result. I believe this to be the true explanation: The regurgitation of the blood in the large arteries, which takes place as soon as the impulse of the heart's contraction is removed, is competent to *close* the valves at the orifice of such vessels. Now if air is substituted for blood, the valves do not close, and the circulation of the blood is arrested, however vigorously the heart may continue to beat. Instant death is the result. Further, in this instance the detachment of a portion of the placenta opened some of the uterine sinuses, and the autopsy showed that they were not plugged up by coagula. It only remains to show that air may have been injected into the womb together with the water.

[1] Demonstrated by a drawing shown in court.

If I take this syringe, which is alleged to have been used in this case, and place the orifice of the supply pipe in this basin of water, and the nozzle of the discharge pipe in this tumbler, it will be seen that numerous bubbles of air are constantly thrown out with the water upon every compression of the bulb. That this air enters through some defect in the bulb is made evident by the fact that the bubbles cease to appear the moment the entrance of air at this point is prevented by squeezing the bulb while it is under the surface of the water in the basin. Thus it appears that air must have been mixed with the water injected into the womb of this woman.

Again, take the catheter found upon the person of the accused, and the strange nozzle filed to fit the same; attach them to the same syringe, placing the end of the catheter beneath the water in the tumbler, and squeeze the bulb which is still under water so as to exclude any leakage of the bulb, and a perfect effervescence of fine bubbles will be seen to take place in the water in the tumbler. This air finds entrance between the nozzle and the catheter. The missing link in the evidence is thus supplied; for it is clear that if water through this syringe and catheter was injected into this woman's womb, air must have entered with it in large quantities.

The frothy blood in the thoracic integument so soon after death tends to confirm the above theory of the cause of death, but would not be of itself conclusive proof.

At the sixth or seventh month of pregnancy a physician of ordinary skill ought to diagnose an uncomplicated pregnancy, especially if his suspicions had been aroused. In this case the finger could pass through the neck of the womb and touch the membranes and head of the child, as was done by those who made the autopsy. Intra-uterine injections are especially dangerous in pregnancy. I am not aware that cotton root is used by the regular profession. Air embolism is rare. Had it occurred in any of the vessels of the brain death would not have been instantaneous. Physicians are liable to make mistakes in complicated or obscure cases. If they have done so they are not usually allowed to forget the fact.

Dr. J. B. Brewster, from the testimony of Drs. Gleason and Spooner, believed that the death of this woman was the result of the use of the intra-uterine douche. The most probable theory of the manner of death is the entrance of air into the uterine sinuses. He corroborated the testimony of the medical examiner as to the cause of the deep redness of the uterine surface from which the membranes had been detached, and also as to the cause of the vaginal excoriations or abrasions. He believed intra-uterine injections in pregnancy were dangerous. He also believed that pregnancy in this instance was easy of diagnosis. Cotton root as an emmenagogue is not generally used by the profession.

Dr. W. B. C. Fifield testified that, in view of the facts developed by the autopsy, it was his opinion that this death was caused by an interference with the process of gestation in the pregnant woman. The manner he believed to be by air embolism. The tincture of aloes and myrrh is a warm, stimulating purgative, with a limited use as an emmenagogue. As such it produces a flow of blood to the uterus, which in pregnancy sometimes causes abortion.

Dr. R. H. Fitz testified that he examined microscopically the heart and kidneys given him by the medical examiner, and found in them no evidence of disease. He corroborated the testimony of the other medical witnesses as to the danger of injections of water and air into the womb in pregnancy, and as to the improbability that this woman's death was due to embolism proper. He did not think that in any case, as the result of the intra-uterine douche, a clot could be instantaneously formed and carried into the circulation and cause immediate death. In case of sudden death from embolism, careful autopsy would reveal the embolus. If large, it would be found near the heart. In case of air injected into the uterine sinuses, it would be found in the lungs and right side of the heart. A small amount, causing death, would produce that result gradually; a large amount *at once*. To find the air "it would not be absolutely necessary to examine the lungs, for in certain cases the examination of the heart suffices."

Drs. G. F. Bigelow and J. E. Graves were called by the defense; they testified to the fact that physicians are liable to be deceived in diagnosing pregnancy. Mistakes in this direction have been made by men of all degrees of skill and experience. Cases of suppression of the menses have been known to continue for months, to be attended with abdominal enlargement, and sometimes accompanied by local discharges. In case of a healthy woman in the seventh month of pregnancy, her physician would be likely to know her condition. Both these witnesses concurred in the opinion of the medical examiner and others as to the cause of death.

The story of the prisoner was in some directions not only inconsistent, but highly improbable. Though he professed to be a regular graduate in medicine, and that he had had obstetric experience, admitting that this woman had been under observation during the last five months of her life, and that he had made what he called "manual examinations" with the object to determine this point, he nevertheless alleged that he was *unable* to make out her pregnant condition. Accordingly, at first, he had been treating her for suppression of the menses, and later for a "uterine leucorrhœa," as he termed it. He admitted having been to Hingham on three several days during the four weeks just previous to June 8th, at each visit administering a vaginal douche; while on that day, the day of the death of the woman, with the catheter and syringe,

connected by means of the nozzle prepared for the purpose, he gave an intra-uterine douche, at length giving up to Mrs. H. the instrument, which she herself applied, as he walked away from her bed toward the window. While using it she fell back, and instantly expired.

After a review of the testimony by counsel, the case was submitted to the jury, who in an hour returned a verdict of guilty. The defendant's sentence was six years' imprisonment at Concord.

THE DUTIES OF MEDICAL EXAMINERS

CONSIDERED IN THEIR PRACTICAL RELATIONS.[1]

BY ASA FRENCH,

District Attorney for the Southeastern District of Massachusetts.

THE subject assigned to me is one of very great interest, not only to the members of this society, but to the community at large. Chapter 200 of the Acts of 1877, abolishing the office of coroner and establishing a board of medical examiners, brought a change from a vicious system, under which great abuses had sprung up, to one which provides for the most thorough and impartial investigation of all cases of death, the circumstances of which suggest criminal violence. Ignorance and inefficiency, and too often corruption, have given way to educated skill and an honest seeking after the truth. Nothing can hinder the complete success of the new plan but an inexcusable failure to comprehend its spirit and to work out its purposes faithfully and fearlessly.

The act requires the governor to appoint to the office of medical examiner "able and discreet men, learned in the science of medicine." Having good reason to believe that the requirements of the statute in this regard have been fully complied with, I can hardly hope to furnish instruction to such a body of men. Their observation and experience in office would much better entitle them to instruct me.

But it has been suggested that there are still questions arising under the new law about which there is some uncertainty, and a brief discussion of which may be useful. The right construction of a new statute is always a matter of difficulty, and I must warn you in advance that any individual opinion is not to be received as settled law. That is determined in this commonwealth by the Supreme Court.

Passing over the preliminary sections providing for the appointment of medical examiners, etc., we find that their duties are first specifically defined in Section 8: —

"Whenever a medical examiner has notice that there has been found or is lying within his county the dead body of a person who is supposed to have come to his death by violence, he shall forthwith repair to the place where such body lies, and take charge of the same."

[1] Read at the annual meeting, June 10, 1879.

What constitutes a "notice" is the first inquiry. I answer, Any reliable information of the fact. The notice need not be a formal one; whenever and however the medical examiner becomes aware that a dead body has been found under circumstances of suspicion, his duty is to attend and take charge of it without delay. He should not refuse because the body is without the limits of the district for which he was appointed, if within his county. Courtesy would perhaps require him to notify his brother examiner in the district as soon as convenient, and to invite his presence and coöperation; but the work of examination and inquiry ought not to be delayed on that account. Time is often a very important element in these investigations. The sooner the fact is ascertained that the death was the result of criminal violence, the more speedily will the officers of the law be on the track of the criminal, and the greater the chances of apprehending him before he has concealed the evidences of his guilt.

Should the body be moved from the place where found before the medical examiner has arrived? As a rule, I answer, *never*. The exact position of the body when found may be of the utmost importance in determining the cause of death. True, that can be testified to by those who discovered it, but it is far better, whenever practicable, that the trained eye of the medical examiner should see this for itself. This would not be so important in a case where there were eye-witnesses to the homicide; but where the finding of the body is the first information, I should disapprove of moving it until after the arrival of the medical examiner. That such is the intent of the law is clearly implied in the language of the final clause of Section 8, where the medical examiner is required, before making the autopsy, to call the attention of the witnesses to the "position," as well as the "appearance," of the body.

In case the medical examiner is forcibly resisted in taking possession of the body, or in making an autopsy, how shall he enforce his authority? The law (now repealed) prescribing the duties of coroners, upon the notification of the finding of a dead body,[1] uses language almost identical with that of the section which we are considering. And the fact that no case is to be found in our reports where this question has arisen shows pretty clearly that it is not likely to be of any great practical importance. No specific authority is conferred by the statute upon the medical examiner to use force when resistance is offered; and in the absence of such authority, should the emergency arise, my advice would be to confer at once with the prosecuting officer of the district, and proceed under his instructions.

To whom should application, in the first instance, be made for authority to make an autopsy? The rule adopted in my district has been to apply first to the selectmen. They are usually more accessible

[1] Gen. Stat., chap. 175, § 2.

than the district attorney, and thus promptness of action is secured, which is often important. They are, moreover, in a better position to judge as to the necessity or propriety of an autopsy in a given case. But in any exigency I should not hesitate to authorize an autopsy before application to the selectmen, and always when satisfied that they had unreasonably refused to grant such authority, — a state of things not likely often to occur.

The question whether an autopsy is or is not necessary is one which calls for the exercise of the greatest discretion on the part of the medical examiner. It happens, not infrequently, that the relatives of the deceased are opposed to such a step. Nevertheless, private wishes or preferences must yield to the general good. The question is, Is it possible to determine accurately and conclusively the cause of this person's death without an autopsy? If so, there can be no excuse or justification for demanding one. The purpose of the law is not to furnish subjects for dissection, but only to discover crime; and regard for the honor of their profession, no less than for the reputation of their official position, should lead medical examiners to be extremely cautious in this matter. But whenever any reasonable doubt exists as to the cause of death, after inspection and inquiry, by all means let the autopsy be made.

In performing an autopsy under the statute, it is not indispensable that the examiner should use the scalpel *personally*. Being "learned in the science of medicine," he is presumed to be competent for the work, however intricate the case may be; and ordinarily it would be better for him to act personally, leaving it to his assistants to record the results. But if done by another, under his eye and direction, it will answer all the requirements of the law.

An autopsy, when made, should be thorough, complete, and exhaustive, demonstrating clearly the true cause of death, and excluding all other hypotheses. In a recent trial for criminal abortion by the injection of air into the womb, a full account of which has been presented at this meeting by Medical Examiner Gleason,[1] the defendant's counsel, on cross-examination, closely questioned the government witnesses, who assisted in the autopsy, as to the appearance and condition of the kidneys and heart of the deceased woman. Fortunately, these organs had been submitted to a microscopic examination, and the government was able to show that they were in a healthy condition, thus silencing any suggestion of death from that quarter. It is not enough to find an adequate cause of the death; the examination must go farther, and exclude all other causes. Not until this is done can the autopsy be said to be complete. The skillful medical examiner will never stop short of this point.

[1] See page 79.

The record of the autopsy should be full, clear, and minute, — so far, at least, as relates to the cause of death. The negative portions of it may be in more general terms. The use of technical terms is not objectionable, if the examiner is prepared to translate them when he becomes a witness, and make them comprehensible to the unprofessional mind. The ability clearly to state his case is of the first importance to the examiner when he is called into court; and this of course presupposes a thorough knowledge of it beforehand. The copy of the record of his autopsy, which, by Section 9, the medical examiner is required to file in court and with the district attorney, should be an accurate copy, as the term implies, and not merely an abstract. What parts of the record may or may not be important to the officers of the law he cannot anticipate, and he ought, therefore, to obey the mandate of the statute literally.

Certain incidental duties and liabilities are imposed upon the medical examiner in Sections 16 to 21, inclusive, which may be adverted to very briefly. Section 16 confers the power to employ a chemist, when necessary, who shall be paid such fees as the examiner certifies to be just and reasonable, after having been allowed by the proper auditing board. Of course, none but skillful chemists should be engaged in these cases, and only such fees certified for the work performed as will bear the strictest scrutiny. From his general familiarity with such matters, the medical examiner is peculiarly fitted to make this certificate.

Section 17 prescribes the mode in which the funeral expenses of a stranger shall be defrayed. A difficulty may arise here in determining the question of "settlement," and a wrong decision of that question would fix the burden of these expenses where the law did not design them to be placed. A town wrongfully compelled to pay such a bill would naturally feel aggrieved, and complain that the medical examiner had not made that "careful inquiry" which the law requires of him, — a case of actual occurrence a few years ago in the county of Norfolk, under the old law, in which the same duty was imposed on the coroner. A proper exercise of caution will avoid all danger from this quarter.

Under the provisions of Section 19, "it is the duty of a medical examiner who finds personal property upon the dead body of a person killed by accident, and rightfully takes possession thereof, to deliver the same to the true owner on reasonable demand and proof of ownership; and if he refuses to do so upon the sole ground that it is his duty, as medical examiner, to deliver the same to the administrator of the estate of the deceased person, an action of replevin may be maintained against him therefor." But he may refuse to surrender it until reasonable proof of title is adduced by the party claiming it without incurring

such liability.[1] The same principle would apply in a case of death by criminal violence, with this important exception: that where the possession of any or all of such personal property is deemed necessary by the officers of the law in furthering the ends of justice in the case, the medical examiner will be protected in delivering it to them as against the rightful owner.

When the medical examiner is satisfied, upon inquiry, that the deceased person has no next of kin in this State, he ought to remove the property at once to a place of safe-keeping, and give immediate notice to the public administrator, who will relieve him from any burdensome responsibility of this kind.

The inquiry, What constitutes a "fraudulent neglect or refusal to deliver such property," under Section 20, we will postpone to that day — long and late let us hope it will be — when the medical examiners of Massachusetts have degenerated into a very different body of men from what they now are!

These incidental duties performed, notice having been given to the district attorney and to the proper court, attested copies of the record of the autopsy filed, and the proper certificate made to the officer having the registry of births, marriages, and deaths, as required in Section 9, the functions of the medical examiner, as such, in the case are ended. He may be called to testify as a witness in subsequent proceedings, but that is only incidental. I need not say to you that these are exceedingly delicate and responsible duties, requiring not only professional skill, but also the exercise of good judgment and a sound discretion.

Cases will arise in which it is difficult to determine whether the death resulted from violence, within the meaning of the statute, or from natural causes. Whatever the opinion of the medical examiner may be upon this point, he should unhesitatingly express it, undeterred by private influence on the one hand, or by popular clamor on the other. The duty is a personal one, and he cannot shift it upon other shoulders.

The law wisely refrains from imposing judicial duties upon the medical examiner. He is selected on account of his professional experience and skill, and the work which he is called upon to perform is one which pertains peculiarly to his profession. He is not even authorized to obtain his information from sworn testimony, and the only summary authority conferred upon him is in obtaining the presence at the autopsy of "two or more discreet persons" as witnesses, "whose attendance he may compel by subpœna, if necessary." The word "compel" is a strong term, and would seem to imply the power to issue a *capias* in case the witness refused to respond to the subpœna, and to punish for contempt, and these are judicial functions. Did the framers of the law

[1] Smiley *vs.* Allen, 13 Allen, 471.

contemplate this? Looking at the whole statute, and seeing how carefully it separates the duties of the medical examiner from those of the court, that being, indeed, one of the leading features of the new system, I am inclined to answer in the negative. Practically, it is of little importance whether this is the correct interpretation of the clause or not. A case will seldom, if ever, occur where the medical examiner will be obliged to resort to a subpœna for his witnesses, and still rarer where his subpœna will be disobeyed. And as the purpose of this paper is to give safe advice, and not to lead the unsuspecting medical examiner into trouble, we will postpone the final decision of that question until it actually arises.

The aim of the medical examiner in the conduct of his office cannot be too high. He should strive to win the fullest confidence of the community in which he acts. To insure this he has only to apply to his official action the same exalted standard which governs his professional practice. Public opinion sanctioned and demanded the abolition of the old system. It will sustain the new one just so long as the mistakes and abuses of the old are avoided.

CLINICAL AND ANATOMICAL EVIDENCES OF ABORTION.[1]

BY MEDICAL EXAMINER C. C. TOWER, M. D.

MEDICO-LEGALLY regarded, the term abortion is not restricted in its signification, as in obstetrics, to the expulsion of the contents of the gravid womb previous to the close of the sixth or the commencement of the seventh month, — the limits of the period variously assigned for the viability of the fœtus, — but is applied indiscriminately to all cases in which pregnancy is terminated before the expiration of the full term.

Obviously an important and prerequisite point to be decided in a case of alleged or suspected abortion is whether pregnancy has recently existed. The solution of this question must be determined by the usual signs laid down by authorities on the subject. If the evidences of abortion are plainly manifest, pregnancy must be at once admitted. If, on the other hand, proof be clear that pregnancy has not existed, then the question of abortion is dismissed. It must be admitted, however, that the diagnosis of pregnancy in the early months is by no means an easy matter. This admission is conceded by writers on obstetrics and on medical jurisprudence, and the experience of the practicing physician confirms it. On the authority of Woodman and Tidy, "there is probably no subject in the whole domain of medical practice on which so many mistakes have been made as in the diagnosis of pregnancy." They further assert that "no reliance, for legal purposes, is to be placed upon the feelings or fancies of the woman, nor on the accounts given you by herself or by her friends. Your reliance must be upon physical signs."

The clinical evidences of abortion may, for convenience, be arranged under two classes: first, those which apply to the process while actually going on; second, those which indicate that the act has been already accomplished. The former belongs more particularly to the province of the physician; the latter comes within the domain of the medical jurist, and will be alone considered here. Its consideration will involve three kinds of evidence, which I will designate as moral, causative, and demonstrative or *prima facie* evidence. The first two

[1] Read at the annual meeting, June 10, 1879.

may be regarded as indirect or circumstantial, the last as direct or positive.

I. *Moral Evidence.* — What has been termed moral evidence is that which the medical examiner obtains from a history of the patient's life, from her reputation as based upon her known or ascertained moral standing, and from her social position. This kind of evidence is particularly applicable to those cases where there is an attempt on the part of the aborting woman to elude the scrutiny of her attendant, and to represent that her sickness is something else than it really is, or due to causes other than the true ones. "By this moral evidence in suspected cases," says Van DeWarker, "the physician must constantly be prepared to profit. A marked suspicion of the medical attendant, and an unwillingness to have the bed, napkins, or vessel examined, ought to send the physician on a tour of discovery at once."

Moral evidence, if not at all times strictly reliable, is, under certain circumstances, entitled to considerable weight; but medical men have often been deceived by it. Its value, therefore, should be measured by corroborative testimony of a more positive character.

II. *Causative Evidence.* — A knowledge of the ætiology of disease has an important bearing on diagnosis. It should be the duty of the physician, when called to any case of sickness, to determine, as far as possible, the nature of the cause. In suspected abortion is this precaution specially important, as the evidences of this process are in great measure characterized by the kind and manner of its causation; whether, for instance, it be slow-acting or sudden; whether centric or eccentric; whether spontaneous, or accidental, or provoked.

It is not my purpose to enumerate all the assignable causes of abortion. The classification adopted by Barnes is the most scientific and comprehensive of any which I have examined. This eminent authority arranges all the causes of abortion under two general divisions, namely, those of maternal origin and those of fœtal origin. For the purposes of the medical examiner it is chiefly necessary to determine whether an abortion be due to natural or to violent causes.

Of the natural predisposing causes of abortion, according to Guy and Ferrier, those "dependent upon the state of the womb are very numerous, especially in the early months." There may be disease "in the placenta, or in the fœtus itself, and it may assume any form of structural degeneration." These authors cite Velpeau as authority for the statement that "of upwards of two hundred embryos expelled before the end of the third month at least one half were diseased." On the other hand, syphilis, which is admitted to be one of the recognized causes of abortion, does not, we are told, "usually endanger the product of conception until the later months." It is well known that the habit of aborting is easily acquired. A previous miscarriage, therefore, may act as a cause of abortion.

Of the natural *exciting* causes of abortion, those which act through the nervous system are the most frequent. Probably, however, many of the trivial circumstances mentioned by Whitehead, which are regarded as exciting causes, really take their origin far back in some preëxisting morbid condition of the maternal or fœtal organism. In this way, only, can we account for the fact that one woman will abort from the slightest physical or emotional excitement, while another will not miscarry from the most powerful influences which can be brought to bear upon her nervous organization.

All unnatural causes of abortion are considered as violent, and include those which are the result of accident and those which are designedly procured. Of the accidental causes are injuries proceeding from casualties of any kind. A knowledge of attending circumstances is usually sufficient to distinguish this class of causes. The alleged injuries, however, should be carefully examined with a view to their causative effect. When abortion is provoked, it may be done advis edly, for reasons considered to be salutary to the mother. Although this proceeding, judged from a legal point of view, may not be strictly legitimate, yet from a medical stand-point there are conditions sometimes, though rarely, existing which are believed to render the practice professionally correct. This is a question of medical ethics, and does not require discussion here.

The *criminal* means employed to procure abortion are general and local in their action, and include (1) the use of abortifacient drugs, and (2) a resort to external or internal violence.

The so-called abortives, or abortifacients, embrace a long list of medicinal agents, most of which possess no special emmenagogue or oxytocic properties. Considerable difference of opinion has prevailed whether spurred rye, for example, is capable of producing uterine contractions sufficient to expel the fœtus before the expiration of the full term. H. C. Wood says: "The action of ergot in producing contraction in the impregnated but not parturient womb is by no means constant." "It cannot be gainsaid," he adds, "that the drug has failed sufficiently often to show that its abortifacient action is uncertain." Whatever disagreement may exist as to the efficacy of this drug in originating contractions in the impregnated womb, there can be little, if any, doubt that when uterine action is once established, from any cause, it will be greatly accelerated by its use. On the whole, agents of this class are so unreliable in their action, and are attended with so great danger, in the large doses which are required, that they are believed to be seldom relied upon by the professional abortionist. The female herself, when fearful that conception may have taken place, sometimes resorts to them, but usually unsuccessfully.

External violence, purposely inflicted, sometimes effects the desired result; but unless directed in its action to the site of the gravid womb, and unless attended with dangerous severity to the maternal parts, it usually fails of its object. Remarkable instances are on record of fearful and repeated attempts at violence externally inflicted, to the great peril of the woman's life, and pregnancy still go on uninterruptedly. When, on the other hand, there has been a predisposition to abortion, from any cause, the slightest degree of violence has developed it.

The local measures which are believed to be chiefly relied upon to force abortion are the use of sharp-pointed instruments, which are often violently and ignorantly thrust into the uterine or peri-uterine tissues, as chance may direct, and the employment of syringes for injecting liquids into the vaginal or uterine cavity. The former class of mechanical agents includes a great variety of implements, from a wooden skewer to a guarded stiletto. Within a fortnight I have listened to a description — by an aged and gray-headed woman, whose two married daughters have repeatedly, as I believe, lost their offspring by criminal means — of an instrument said to be owned by a medical man (not a member of the Massachusetts Medical Society, I am happy to say), and specially designed for this nefarious work. When the operation is performed by a skilled expert, — for practice makes perfect in illegitimate as well as legitimate surgery, — the amniotic sac is punctured and the fluid allowed to drain away, to be followed by certain abortion.

When liquids are injected, simple warm or cold water, or possibly some irritant fluid, is used. Ogston tells us, on the authority of Tardieu, that "some women during attempts of the sort" which I have alluded to, "experience little or no sensation beyond, it may be, a poke or prick; others, moderate pain; while in the greater number the operation gives rise to immediate and severe pain, a tearing sensation in the hypogastrium or epigastrium, nervous attacks, faintings, or complete and sudden syncope. A little blood almost always escapes at once, and, though but rarely, liquor amnii. . . . When the manœuvres of the operator have completely succeeded, the expulsion of the fœtus follows within four hours, or sometimes immediately, while in other cases it may not happen for six, seven, eight, or eleven days."

I can testify to the correctness of the above statement, so far as it applies to a single case. In recent conversation with a woman, the mother of several children, whom I attended a few months since during her unnatural sickness, I was informed by her, on my urgent solicitation,— and for purposes connected with this paper, — that the method employed by the abortionist was the so-called "injection method;" that the procedure was perfectly painless, and unattended by shock,

syncope, or other unusual sensation whatever. The operation was performed on Tuesday morning, and out of town (probably in this city). On retiring at night the woman noticed a slight stain on her underclothing; she kept her bed next day, on account of "shivery feelings." There was no "show" to speak of and no pain until Friday afternoon. In the evening of that day I was sent for, because of the severity of the pain. She did not intend to employ a doctor, but was obliged to do so on account of pain, not on account of hæmorrhage. The husband, evidently thinking that I should detect the true condition of things, made a voluntary statement of what his wife had been doing, against, as he said, his wishes. On examination I found the os uteri high up and but slightly dilated. Nothing unusual was detected in the condition of the vagina or cervix. There was marked hypogastric tenderness externally. I administered morphia hypodermically, and saw her the next morning, when I was informed that she experienced great relief of pain from the anodyne, but that the sickness continued until two or three in the morning, when the ovum passed away entire.

It will thus appear that nearly four days elapsed in this case between the manipulation and the expulsion, that pain attended the final result only of the operation, and that no excess of hæmorrhage occurred at any time. It is possible that puncture of the membranes was resorted to instead of injection, as the woman admitted that she did not see the instrument, but only noticed that her clothes were slightly wet after the performance was over. The kindly course of subsequent events up to the period when abortion took place would seem to favor the latter hypothesis. After the abortion was accomplished, however, a certain amount of tenderness at the hypogastrium, accompanied with pain and fever, continued for a period of two weeks, requiring rest in bed and the use of opiates and fomentations.

Doubt has been expressed by some writers on medical jurisprudence whether a woman can manipulate herself internally so as to procure an abortion. It is stated that a knowledge of the anatomy of their reproductive organs is necessary to enable them to accomplish this delicate manœuvre. There is good reason, on the contrary, for believing that women in their desperation do sometimes resort to the use of instruments upon their own persons for this very purpose. Van De Warker alludes to the practice of self-probing in these words: "Among women who have achieved the difficult feat of auto-catheterism of the uterine cavity, they usually probe themselves at the expiration of the first month if the menses are tardy in their return." "I know," he continues, "of several such model countrywomen, and have had many other cases of like nature related to me by other practitioners."

Taylor, speaking of the local injurious effects of mechanical means in procuring abortion, says: "This kind of injury to the uterus im-

plies the interference of some other person in the perpetration of this crime." The following case, which came under my own observation, will disprove this assertion. In July, 1864, I was hastily summoned to attend a woman (derisively styled a "war widow") whose husband was away in the defense of his country. She was suffering from acute inflammation, indicated by excessive tenderness at the hypogastrium, pain, and fever. The pain was agonizing in intensity, and the fever high. Opiates and other measures to combat inflammation were resorted to, and the following night an ovum of two or three months was expelled, but disposed of before my arrival in the morning. For a week or more inflammatory and septicæmic symptoms were severe, and the woman's life was considered to be in great danger. Offensive vaginal discharges required the use of antiseptic injections. After her recovery she informed me that the abortion was procured by self-inflicted punctures of the womb with an instrument which was furnished her by her guilty paramour, and which she exhibited to me. It was made of horn or bone, and resembled the long, tapering handle of a pen-holder, which I believe it was, although the woman seemed to take pride in asserting that it was an instrument designed for the purpose for which she employed it. No less than six attempts were made before she succeeded, which were repeated twice a day. She was taken violently and suddenly ill shortly after midnight following the evening when the last thrust was made.

One further illustration of the criminal means employed by a woman to procure abortion will be given. September 30, 1874, in response to a hasty summons, I found Mrs. B., aged twenty-seven, the mother of a child of two years, lying dead on the floor in her bed-room. The body presented the appearance of having been dead but a short time. I learned the following circumstances relative to the case. An elderly woman, who occupied rooms in the same house as the deceased, saw her alive and well half an hour before she discovered her lifeless body lying flat on the back, the bare legs exposed, and a new elastic rubber syringe in close proximity to, or in actual contact with, the external genitals. A basin containing water was also near by. The woman who made this discovery has recently informed me that she found the syringe underneath the skirts of the dress of the dead woman, while attempting to cover the naked limbs, and cannot, on account of her agitation at the time of the event, remember distinctly whether the stem of the outlet pipe of the syringe was within the genital passage or not, but she thinks it may have been. A coroner having been called, he authorized me to make such examination as would be sufficient to reveal the cause of death. The uterus contained a four-months' fœtus inclosed within the envelopes. The cervix was perfectly normal for the pregnant state. The os uteri was slightly di-

lated, the mucous plug was broken up, and the cervical canal was pervious to the passage of the stem of the syringe. The fœtal membranes were unruptured, but separated from the uterine wall at the lower or presenting parts. According to the best of my present recollection, this dissection continued upwards, on the anterior surface of the uterine cavity, towards the attachment of the placenta near the fundus. Whether or not a portion of the placenta was separated from the uterine wall I am unable positively to state, but my decided belief is that the placenta was partially detached. Death was attributed to shock from the sudden forcing of water into the cavity of the womb, or to syncope from the entrance of air into the maternal circulation.

This case strikingly resembles that reported by Medical Examiner Gleason, of Rockland, to-day, and differs from his principally in the circumstance that it was without doubt self-committed. Probably the woman, not being familiar with the use of a syringe of this kind, did not exhaust it of air before introducing the pipe. This opinion is corroborated by the fact that little or no water was spilled upon the floor, and that neither her person nor her clothing was wet. No evidence of hæmorrhage was observed, if we except a slight blood-stain on the inner surface of one thigh. This was supposed to have been caused by the bloody nozzle of the stem of the syringe trailing against the skin as it was unintentionally withdrawn from the genitals during the first moving of the body.

III. The *demonstrative* evidences of abortion include the symptoms manifested during the process, the expelled products of conception, and the puerperal condition of the woman. The scope of this paper does not allow the introduction of the evidences derived from the process while in operation. These come within the special cognizance of the accoucheur.

When miscarriage has already taken place, we must look for evidence of an entirely different character from that to be observed when the act of abortion is still going on. That derived from an examination of substances expelled from the womb is not to be overlooked. It will be reliable according as an ovum in the process of development is advanced towards maturity. The chief difficulty will arise in distinguishing between an early ovum and moles, hydatids and false membranes.

During the first two or three weeks the ovum would be so extremely minute that it could scarcely be detected in the clots of blood with which it would be surrounded, and, if detected, could not with certainty be recognized without magnifying power.

At the end of the first month it is described as being without perceptible definiteness of structure, and measuring in length about one

centimetre, its weight being about one gramme. "The villosities of the chorion," say Guy and Ferrier, "uniformly spread over the surface" at this early period. It is, also, according to Playfair, "surrounded by the amnion, and the pedicle of the umbilical vesicle can be traced into the unclosed abdominal cavity."

At the end of the second month "the embryo becomes more distinctly apparent, and is curved upon itself." Its length has increased to four centimetres, and its weight to eight grammes. "The head and extremities are distinctly visible." "The umbilical cord is quite straight, and inserted into the lower part of the abdomen." After this period, says Taylor, "development goes on rapidly; the features are in part well marked, and the extremities are gradually formed."

At the expiration of three months the length is variously stated at from seven to twelve centimetres, and the weight from thirty to ninety grammes. "The parts of generation are prominent and the sex distinguishable by the lens." The decidua vera and decidua reflexa are in contact, and the placenta is distinctly formed.

After this period, of course, the fœtus would be readily recognized in its envelopes, and its age estimated by its size and development. It is seldom that the medical examiner would be placed in a situation to determine upon the presence or absence of the early ovum, because women rarely apply to the abortionist until after they have missed the third menstrual period. It is possible, however, that they may have obtained of the apothecary specific medicines which have brought on the desired uterine action, perhaps attended with alarming, or even fatal results.

Fleshy moles are now generally regarded by pathologists as products of conception. In forensic medicine, however, positive evidence of an embryo having existed is required as proof of abortion. Some constituent parts of an ovum, therefore, must be identified as evidence of this event. The use of a microscope may be required for this purpose.

There is, according to Guy and Ferrier, "a decided balance of opinion in favor of hydatids being in all cases products of conception." If so, the discovery of cysts in the uterine discharges would be satisfactory evidence of abortion.

The presence of false membranes among the sanguineous discharges would indicate some morbid condition of the womb unconnected with pregnancy. Fibrinous casts of the uterine cavity, if such really occur, are associated with some form of inflammatory action, perhaps diphtheritic, and are not to be confounded with membranous casts and patches of epithelium, which are sometimes thrown off in dysmenorrhœa. The latter are, without doubt, sections or layers of the mucous membrane of the womb, or, possibly, if we may credit the

statements of some eminent authorities, the entire mucous membrane itself. They are said to occur, sometimes, independently of the menstrual disorder. "It may readily be conceived," says Leishman, "that in such a case, accompanied, as it generally is, with hæmorrhage and sustained expulsive effort, a suspicion of pregnancy and early abortion might arise in the mind, — the membrane in question being mistaken for the decidua from which the embryo has escaped unobserved." Virchow, perceiving the similarity of this membrane to that of the deciduous membrane of pregnancy, has proposed for it the name of "menstrual decidua." Both are, indeed, formed from, or are modifications of, the true mucous membrane of the cavity of the womb, and both, therefore, on microscopical examination, reveal the structure of that membrane. Thomas, in his work on the Diseases of Women, states that "an entire membranous cast, when washed and examined by the naked eye, is found to be triangular, with three openings, two at its upper angles and one at its lower. Its external face is soft and irregular, and everywhere shows small perforations, which are openings of utricular follicles. The inner face is free from inequalities, and feels like mucous membrane. . . . Under the microscope the cast is found to consist of the lining membrane of the uterus, hypertrophied in all its elements almost exactly as it is in pregnancy." If we compare this description with that of the decidua of pregnancy, as given by Playfair, a remarkable resemblance between the two is apparent by the naked eye and under the microscope. "When the decidua," says Playfair, "is first formed, it is a hollow, triangular sac lining the uterine cavity, and having three openings into it, those of the Fallopian tubes at its upper angles, and one, corresponding to the internal os uteri, below. . . . When it is most developed, a careful examination of the decidua enables us to detect in it all the elements of the uterine mucous membrane greatly hypertrophied. Its substance consists chiefly of large, round or oval nucleated cells and elongated fibres mixed with the tubular uterine gland ducts, which are much elongated and filled with cylindrical epithelium cells and a small quantity of milky fluid." Such a resemblance in the outward appearance and intimate structure existing in these two membranes, originating under different conditions of the womb, prepares us for the assertion that "the most skillful microscopists cannot distinguish one from the other." The experiment of submitting specimens of membranous casts from the same patient to different and eminent microscopists has been tried, and, on the authority of Dr. Mandl, of Vienna, as quoted by Thomas, they arrived at directly opposite conclusions: one attributing the formations to menstrual origin, and the other to that of conception.

We are not, however, to confound the appearances presented by the

membrana decidua, which is of strictly maternal origin, with those of the chorion and amnion, membranes of purely fœtal origin. Of the expelled substances which accompany an abortion the outer envelope of the embryo may usually be recognized with the naked eye by its shaggy appearance, and under the microscope by the peculiar glove-like projections which constitute the chorionic villi, or, at a later stage of pregnancy, by the tufts of fœtal blood-vessels which enter into the formation of the placenta. The amnion may be recognized by its smooth surface and thin, transparent substance, made up of flattened nucleated cells which overlie a stratum of fibrous tissue, and by its entire absence of blood-vessels. The villi of the chorion, it is said, may be detected in the lochial discharges which follow abortion. If so, they should not be mistaken for the villi of the mucous membrane of the cervix uteri, which they somewhat resemble. We must therefore conclude that evidence derived from deciduous membranes expelled during an early abortion is not wholly reliable unless connected with distinct traces of the embryo or the proper fœtal envelopes.

Evidence of abortion gained from a study of the puerperal condition of the woman is exceedingly unsatisfactory when the event occurs at an early stage of pregnancy, or in women who have previously borne children. Authorities agree that up to the end of the second month there are no reliable indications to be obtained from an examination of the living woman after the expulsion of the ovum. The only possibility of proof should be sought for by vaginal exploration and the use of the speculum. Even then it would be desirable that the examination should be made within twenty-four hours, on account of the rapid changes which attend involution. Sanguineous discharge, a patulous os, a soft and turgid state of the cervix, and a relaxed state of the walls of the vagina might all be simulated by menstruation. Even the detection of shreds of membrane protruding from the uterus might possibly be attributed to dysmenorrhœa. The presence of coagula might be due to menorrhagia or other uterine hæmorrhage unconnected with pregnancy. All these difficulties would be enhanced in multiparous women and in those suffering from certain morbid conditions of the womb.

If gestation have advanced to the close of the third or fourth month, evidences derived from the same source would be more conclusive, especially from the use of the uterine sound. The os uteri would be unnaturally open, and would probably admit the tip of the finger. If instrumental means had been unskillfully employed an abnormal degree of heat and tenderness of the vagina and uterus would, most likely, exist. We would also expect hypogastric tenderness, and, if involution be retarded from any cause, we might detect the sensitive uterine tumor above the pubes. If serious injury to the neck of the

uterus had been produced, this, too, would be recognized on vaginal examination. If remains of the placenta or decidua were left behind, their existence might be discovered. If sufficient time had elapsed for their occurrence, septicæmic symptoms might be developed and their connection with recent delivery traced. If pregnancy had been sufficiently advanced for the establishment of the lochia, they would be of value in diagnosis. They could be distinguished, usually, from other discharges by their peculiar odor, which is *sui generis*, and by containing blood, remains of decidua, etc.

Evidence obtained from the general appearance and condition of the woman would also be, to a certain degree, characteristic. If much hæmorrhage had occurred the countenance would be blanched, unless flushed by fever. Sunken eyes, surrounded by deep and dark circles, are often observed in such circumstances, but as these appearances may also depend upon many other causes much reliance should not be placed upon them as diagnostic signs. A peculiar excitement of the pulse, with dryness of the skin, is said to be invariably present in such cases. If inflammation exist, and especially as a result of mechanical violence, the increase of pulse and temperature would be considerable, the former mounting to one hundred and twenty beats in a minute, and the latter rising to an elevation of 102° Fahrenheit, or, if the inflammation be very severe, to still higher altitudes. The increased firmness and turgidity of the breasts and the peculiar elevations and discoloration about the nipple are sometimes apparent as early as the second month, but usually are not distinct until a later period. Proof would be still more marked if milk could be pressed from the mammary glands, and especially if, on microscopical inspection, it should be found to contain colostrum globules. This test is sometimes applicable in the fourth month.

If abortion occur during the later months of pregnancy, the usual signs of delivery at term would be manifest. In addition to those already described we should find silvery streaks in the integument of the lower abdomen, and, what is more reliable, similar marks on the skin covering the under parts of the breasts. A dark discoloration along the median line from the umbilicus to the pubes can also usually be discerned at any time after the third or fourth month of pregnancy; it is most marked in dark skins. Generally, it may be remarked, in the language of Ogston, that "the signs of recent delivery in the living mother before the full time are the same in kind as those of parturition at the full time, though less in degree, and are consequently more liable to mislead in this case than in the other. In premature labors, and, *a fortiori*, in abortions, the signs of delivery, at whatever time investigated, will be found indistinct in proportion to the immaturity of the ovum."

It only remains to consider the evidences of abortion obtained from post mortem observations. The appearances on dissection will obviously differ very much according to the character of the abortion, whether natural or violent; the period of pregnancy at which it occurred; and the length of time which has elapsed since it took place. I shall confine my attention to the appearances after death shortly following criminal abortion. Externally the body would of course present similar indications to those existing before death, so that observations made under that division of my subject need not be repeated here. It may only be remarked that after death many obstacles which interfered with a full and careful physical examination when the woman was living are now wholly removed. Changes due to pregnancy, which are manifest in the form, size, color, and consistency of the breasts and abdomen, are sometimes quite striking, and at once impress the examiner very decidedly in respect to the conditions which may be found to exist internally. Such was my own experience when, years ago, a young practitioner, I was called upon to conduct an examination of the body of the victim in the "Hersey murder" case, the young woman having died from strychnia poisoning, and her womb containing a three months' fœtus.[1] After the contents of the womb have been expelled, however, the changes attending involution are often so rapid that unless the fatal result follows the abortient act in quick succession many of the proofs of the event, both externally and internally, obtained from the autopsy are either wholly wanting or are of doubtful reliability.

After criminal abortion we often find the external genitals swollen, turgid, ecchymosed, and separated by clots of blood proceeding from the vagina. Discolorations, bruise-marks, and other indications of injury not infrequently appear on various parts of the body, some of which may have been produced after death. But marks of violence externally or internally would furnish no absolute proof of miscarriage, but merely point to a probable cause if proof were discovered. If the use of drugs be suspected, the presence of abortifacient medicines in the alimentary canal would confirm the suspicions previously entertained that attempts to procure abortion had been made in this manner. The specific toxical effects of such medicinal substances should be sought for only on account of their supposed causative agency through reflex influence. Among the effects to be looked for may be mentioned rectal engorgement from irritant purgatives, of which aloes and hellebore are chief, and renal congestion from powerful diuretics, such as savine and tansy.

Positive proof of abortion obtained at the autopsy must, however, be limited to the *signs of recent delivery found in the uterus itself and in*

[1] Report of the Case of George C. Hersey, indicted for the Murder of Betsey Frances Tirrell. A. Williams & Co. 1862.

its appendages, notably the ovaries. In ovular abortion no reliable evidences can be discovered from an examination of these organs. The appearances would be almost identical with those dependent upon menstruation. The general character of them would be such as is due to sanguineous engorgement. "During menstruation," says Orth, "the uterus is enlarged (to the size of a hen's egg); its substance is soft and juicy; the mucous membrane is swollen, succulent, reddened from the engorgement of the blood-vessels, and covered with a more or less pure or watery blood, according to the duration." The now generally accepted view of menstruation is that during the physiological turgidity of the uterus which attends ovulation the net-work of capillaries which surrounds the utricular glands situated in the mucous membrane becomes deeply injected, and an exfoliation of the epithelial lining of the uterine cavity takes place, laying bare the ruptured walls of the minute vessels from which an exudation of blood occurs. We can readily conceive that the interior of the uterus after an early abortion, especially if the decidua had been expelled with the ovum, would present appearances very like what must exist in the unimpregnated organ during the occurrence of the phenomena just described. If, on the other hand, the decidua had been retained, their membranous shreds, as has been shown after expulsion, could not be readily distinguished from patches of dysmenorrhœal casts. If the blood within the cavity of the womb be clotted, that circumstance would be suggestive that abortion had recently occurred; but menstrual blood is by no means destitute of the property of coagulation, although it coagulates with difficulty if the function is normally performed. If the flow is profuse, as in menorrhagia, it clots readily.

The extreme vascular condition of the ovaries and Fallopian tubes during menstruation and early pregnancy would be essentially the same, and, consequently, also in early abortion. Even in the Graafian follicles no changes diagnostic of abortion during the first month of pregnancy could be discerned, their ruptured walls and contained coagula merely indicating that ovulation had recently been going on, and that the process was completed by the discharge of ova.

When abortion occurs at the middle period of pregnancy reliable evidences of the event can usually be detected. These consist in characteristic appearances of the interior of the womb, in alterations in the size, structure, form, and weight of that organ, and in the development of a corpus luteum of pregnancy in one or both of the ovaries. The cavity of the uterus at this period will be found to contain clots of blood or sanguineous fluid, and its surface to be covered with flocculent or pulpy remains of the decidua. The site of the placental attachment — one of the most unequivocal signs of recent delivery — is indicated by a dark brownish, somewhat elevated patch, the surface of

which is described as rugous, unequal, and disorganized or actually suppurating. It also presents "several large, semilunar or valvular openings," — the remains of uterine sinuses, — and is further distinguished by the "small number of flocculi" compared with that of the adjacent surface. If portions of the placenta remain attached, they may be recognized under the microscope by the peculiar structure of that organism.

If abortion occurred at any time during the last three months of gestation, the usual signs of delivery at term would be more or less manifest. The external evidences already alluded to would be more unequivocal. On account of the greater size of the fœtus we should expect to find more marked traces of recent birth at the outlet, as indicated by increased swelling and turgescence of the labia, and perhaps by fresh laceration of the posterior fourchette. If forceps or other instruments to aid delivery had been employed, marks of injury to the soft parts, even rupture of the perinæum, might be discovered. Internally, the greater dilatation of the vagina, the more open state of the cervix, the larger size of the womb, the more extensive traces of placental attachment, and the more copious coagula would leave no opportunity for doubt concerning the occurrence of the recent event. Marks of internal violence, such as punctures or incisions of the uterine walls, could hardly be mistaken at any stage of pregnancy for lesions in the unimpregnated organ caused by operative surgical interference in the removal of morbid growths. "An important point in the diagnosis of a recent labor at full term, or of a premature labor," says Orth, "is an orange discoloration of the mucous membrane of the neck of the uterus, which is often present."

Considerable conflict of testimony seems to prevail among authorities with regard to the existence of the mucous membrane of the uterus, not only after abortion, but also after delivery at the full period. The doctrine enunciated by M. Cruveilhier, and concurred in by Professor Simpson and many other distinguished writers on obstetrics and gynæcology, is that after normal delivery, "except just at the inner surface of the cervix uteri, there is no mucous membrane at all, but the muscular tissue is everywhere exposed." According to this view, the decidua is entirely expelled with the fœtal membranes and placenta during the third stage of labor, leaving the inner surface of the uterus denuded, but "to be covered by a new membrane" during convalescence. The distinguished physiologist, M. Robin, while agreeing with M. Cruveilhier that the original mucous membrane is converted into decidua and thrown off at the termination of labor, promulgated the new doctrine that the muscular tissue is not wholly laid bare, but is covered with a delicate layer of newly formed mucous membrane which has been developing during the latter half of gestation. Dr. Priestley, in his admirable Lectures on the Development of the Gravid Uterus, sub-

stantially agrees with M. Robin concerning the formation of a new mucous membrane during the last months of pregnancy, but cannot concede that the decidua is entirely removed at the time of delivery. From his personal researches in the human subject he deduces the following conclusions concerning the uterine mucous membrane during and immediately following pregnancy: —

(1.) "After an ordinary labor, terminating in the separation and expulsion of the secundines, the muscular substance of the uterus is nowhere laid bare. . . . .

(2.) "When the membranes are thrown off in the third stage of labor, a portion of the decidua remains attached to the uterine surface as a protection against external agencies. It is not, however, strictly correct to assert that the original mucous membrane may be found everywhere lining the interior of the uterus after delivery; that is true only with regard to the cervix. . . . .

(3.) "A new mucous membrane begins to be formed in the later months of pregnancy between the decidua and muscular coat. It undergoes a rapid development after the uterus is emptied of its contents; and as it is gradually perfected it assumes the function of the original mucous coat."

Leishman, in his System of Midwifery, appears to contradict himself somewhat on this point. In one place he declares that "the separation of the whole mucous membrane of the uterus under the name of *decidua* . . . . always occurs . . . . in women at the moment of delivery."[1] He also speaks of "the exfoliated membrane, and the raw, bleeding surface which its removal necessarily involves . . . . in women who have died shortly after delivery."[2] Elsewhere, in describing the puerperal condition of the inner surface of the cavity of the womb, he asserts that "remains of the decidua vera or of the subjacent textures from which it has been stripped are clearly to be made out."[3] On the whole, he seems to adopt the views advocated by M. Robin.

Still different opinions are maintained by other observers. They are, however, mostly modifications of those already given. Dr. Matthews Duncan, for example, believes with M. Robin and Dr. Priestley that the muscular coat of the uterus is not laid bare, but dissents from them in the doctrine of the formation of a new mucous membrane before delivery. He advocates the opinion that "the residuary decidua forms the mucous lining of the uterus" after parturition. Playfair, in his Science and Practice of Midwifery, represents that "according to Friedländer the decidua is divisible into two layers, the innermost being formed out of the connective tissue of the mucous membrane;

[1] American Edition, page 93.
[2] Ibid.
[3] Page 280.

the deeper seated, in contact with the uterine walls, being formed out of flattened or compressed gland ducts." Spiegelberg, on the same authority, "believes that the portion of the decidua that is expelled is the more superficial" of these two layers, "while the deeper or glandular layer remains attached to the walls of the uterus." The preponderance of opinion, therefore, seems to be that after delivery occurring in the latter months of pregnancy or at the termination of utero-gestation there remains behind a delicate layer of tissue which possesses germinal principles for the development of the new membrane. However this may be, the question still remains unsolved whether a uterine mucous membrane can be detected after an early abortion.

When abortion occurs during the first two or three months of pregnancy, — which period corresponds to that of the greatest development of the decidua, — the embryo and its investing membranes are usually cast off entire. When such is the case, the extremities of the gland ducts, described by Friedländer as existing in the deeper layer of the decidua, may, according to Playfair, "be observed by a lens on the external or uterine surface" of that membrane "occupying the summit of minute projections separated from each other by depressions." This statement proves, if anything, that the deeper layer of the decidua — the germinal layer, which has been described as forming the new membrane after normal delivery — is expelled, and that the lining of the uterine cavity must be devoid of mucous membrane. The following quotation from Leishman shows that there is high obstetric authority for the belief that this membrane is separated not only during abortion, but during menstruation also: "Dr. Tyler Smith states that, having had several opportunities of examining the uteri of women who had died during menstruation, he found that the appearances presented were similar to those which are observed after abortion. '*In each of these cases*,' he says, '*I found the mucous membrane of the body of the uterus either in a state of dissolution or entirely wanting.*'" Our inability to accept this statement, so far as it applies to normal menstruation, may also shake our faith in its accuracy when applied to abortion. If he meant to say that the epithelial layer of the mucous membrane in either case was wanting, it would correspond with what is now generally accepted concerning the phenomena of menstruation, and, by analogy, with what we might expect in effluxion. Dr. Priestley, however, is entirely at variance with Dr. Tyler Smith here, as will appear from the following quotation: "In cases where dysmenorrhœal casts and *early ova* are expelled from the uterus, the conversion of the mucous membrane into decidual structures is probably less complete, and the deep stratum remains behind to prevent the denudation of the muscular coat." That the mucous membrane of the uterus is sometimes shed in abortion is conclusively shown by case No. XXIII. of Professor Dalton's

recent Report on the Corpus Luteum, which will be introduced further on. In view of the testimony here adduced we must conclude that the presence or absence of a mucous membrane in the uterus may or may not characterize an abortion; that while its absence might be regarded as presumptive evidence in favor of that occurrence, its presence should not be interpreted as proof to the contrary.

Changes in the substance of the womb dependent upon functional development of the organ will of necessity vary with the stage of pregnancy at which abortion occurs and upon the amount of subsequent contraction. The uterus of the nulliparous woman gives the following average measurements: —

Length externally	7.5 centimetres.
Breadth	4.5 centimetres.
Thickness	2.5 centimetres.
Thickness of walls	10 to 15 millimetres.
Thickness of mucous membrane	2 to 3 millimetres.
During menstruation	6 to 8 millimetres.

The body and neck are of equal length. The color of the mucous membrane of the body is grayish-red or pinkish, that of the cervix pale. The latter often presents an arborescent appearance, which is sometimes also seen in the former; it is due to the peculiar arrangement of minute blood-vessels. The shape of the uterine cavity on transverse section is triangular, its anterior and posterior walls being in close apposition. The cervical cavity is spindle-shaped. The weight of the whole organ, divested of surrounding tissues, is about thirty-two grammes.

In women who have borne children the size of the uterus is permanently increased, and its weight is nearly one fourth greater, the average being about thirty-eight grammes. The cavity is also larger and its contour more rounded. The length of the body is now slightly in excess of that of the cervix. The well-known changes in the neck and external os due to previous pregnancy need only to be mentioned. There is also a permanent enlargement of the blood-vessels in the multiparous organ.

Shortly after delivery at term the uterus measures in length from twenty to thirty centimetres, and in width from ten to fifteen centimetres. Its parietes on section are from two to three and a half centimetres in thickness, and its weight is given at about seven hundred and fifty grammes. In an interesting case of criminal abortion, recently reported by Dr. W. J. Chenoweth,[1] in which the examination was made eighteen hours after death, the length of the uterine sac was about twenty centimetres, the width thirteen centimetres, and the thickness of the walls five or six millimetres. Probably in this case contraction of the organ was prevented by an extensive laceration which was found in the uterine wall. Pregnancy had advanced from five to six months. The

[1] Cincinnati Lancet and Reporter, May 10, 1879.

weight of the womb was not given. Probably at the middle period of pregnancy the weight would fall between three hundred and five hundred grammes, and its length measure from ten to twenty centimetres.

Changes in the structure of the womb accompanying utero-gestation affect all the tissues, — peritoneal, muscular, and mucous, the arterial and venous system of vessels, and the glandular system. All become enormously hypertrophied. These changes are most noticeable in the muscular and venous structures, the round nucleated fibre cells of the former being transformed into fusiform cells of great length and size, their nuclei being also greatly enlarged, and the latter forming the uterine sinuses. During normal involution these tissues diminish by fatty degeneration, compression, and absorption, the disintegrated material being also largely excreted in the form of lochia. Whether during the diminution of the organ which takes place after abortion similar changes occur I am not positively informed, but such is probably the case. The tissue changes which attend involution of the womb could scarcely be mistaken for any form or degree of abnormal development of the unimpregnated organ, and consequently should be classed among the evidences of abortion.

The importance of the existence of a corpus luteum as a sign of recent pregnancy is so great, in legal medicine, that a somewhat detailed description, borrowed from latest authorities, is reserved for this place. When menstruation is still going on, or is just accomplished, we should expect to find the cavity of the ruptured Graafian follicle filled with fluid blood (according to M. Coste with a bloody fluid), or with a recent bloody coagulum of a "deep opaque red color," and slightly adherent to the surrounding wall, which is smooth and "of an indefinite semi-transparent rosy color." This bloody mass, which is variously designated *corpus sanguineum* and *corpus hæmorrhagicum*, is a pretty constant sign of recent ovulation. "The corpora hæmorrhagica," says Orth, "are of the size of cherries, and appear as dark, or brownish-red, soft masses, according to their age." After the lapse of one or two weeks, whether pregnancy does or does not exist, we shall find, instead of the appearances just described, a similar ruptured follicle, containing a central reddish clot surrounded by a pale-yellowish convoluted wall. This yellowish body is called a *corpus luteum*, and is merely a transformed corpus sanguineum. "The recent corpus luteum," Orth further states, "is somewhat smaller (the size of a hazel-nut to that of a cherry stone); it has a yellowish border, one or two millimetres in width, which is usually somewhat zigzag (convoluted), and a brown or grayish-brown interior."

The process by which a "ruptured and bloody Graafian follicle" is transformed into a corpus luteum consists, according to Professor Dalton, "in a thickening and folding of the wall of the follicle, with the

subsequent development of a yellow color in its substance, and in the condensation, shrinkage, and gradual decolorization of the contained clot." "The more recent the date of the menstrual flow the fresher is the clot in the cavity of a ruptured Graafian follicle, and the less change has taken place in its surrounding wall. A few days later the wall begins to be enlarged and thickened; and this enlargement, within a confined space, causes it to become folded upon itself in short, zigzag reduplications, mainly at the deeper part of the follicle. As the process goes on, the entire wall participates in the hypertrophy. Its convolutions are extended and multiplied, often in a very complicated manner. They project into the cavity of the follicle, encroach upon the central clot, and become pressed against each other, forming by their coalescence a thickened, glandular-looking envelope. Previously to the rupture of a Graafian follicle its wall is a uniformly smooth, vascular membrane, not more than one fourth of a millimetre in thickness. After the rupture, its thickness increases to one half a millimetre; but as the foldings above described grow in number and in depth, and crowd against each other laterally, the apparent thickness of the envelope thus formed becomes much greater, and may reach three or even four millimetres, especially at the deepest part of the follicle."

"In this way there is produced, during the intermenstrual period, a *corpus luteum*, occupying the substance of the ovary immediately beneath the superficial cicatrix which marks the site of the ruptured follicle." "At this time," which probably corresponds to about the twentieth day after the last menstrual flow, "the central clot is red and gelatinous, while the convoluted wall is of a light, rosy hue, mixed with more or less of a yellowish tint." "Subsequently," in the unimpregnated condition of the womb, "the whole structure diminishes in size, and the convoluted wall assumes a more decided yellow," so that when the month has expired, and another Graafian follicle has ruptured, and a new corpus sanguineum is formed, it has already entered upon its retrograde course. The corpus luteum of menstruation, therefore, having arrived at its highest development about the end of the third week of its existence, henceforth, by a process of atrophy and degeneration, gradually diminishes in size and weight, loses its distinctive characters, and gives place to fresh formations with each recurrence of the menses. At the end of the fourth month it has entirely disappeared. On examination of the ovaries of a healthy woman, towards the close of an intermenstrual period, we should expect to find in one or both of them corpora lutea in various stages of growth and decline: that dependent upon the last menstruation being nearly or quite complete in its development; that corresponding to the next previous menstrual flow being in a retrograde condition; and a third, which represents the remains of a ruptured follicle still a month further back, being in an obsolete state

and almost entirely absorbed, so that in a few weeks more no trace of its existence could be discovered. If the examination of the ovaries be carefully conducted, we should further observe that "a number of Graafian follicles approaching maturity are also visible at the same time, one of them being almost always perceptibly larger and more prominent than the rest."

The changes in size and weight which take place in an ordinary corpus luteum during the several stages of its physiological growth and decay can be best illustrated by reference to actual measurements carefully made by Professor Dalton and recorded in his latest paper. I take the liberty of tabulating for my present purpose the following results: —

CORPUS LUTEUM OF MENSTRUATION.

Age.	Stage of Development.	Weight in Milligrammes.	Diameter Measurement in Millimetres.			Volume in Cubic Centimetres.
			Width.	Depth.	Thickness.	
2 days.	Initial.	380	15	10	Not given.	0.4
10 days.	Crescent.	810	14	13	Not given.	0.7
20 days.	Maximum.	1200	13	14	9.5	1.1
6 weeks.	Retrograde.	90	8	5	Not given.	0.1
10 weeks.	Obsolete.	20	6	2	Not given.	Not given.

Although the corpus luteum of pregnancy, during the first month, differs in no essential respect from the corpus luteum of menstruation, yet, as we have seen, the latter has already commenced its retrograde course when ovulation is again accomplished, and a fresh corpus hæmorrhagicum is formed. In pregnancy, however, ovulation being suspended, the corpus luteum pursues an entirely different course of development and retrocession. "After the first month," according to Professor Dalton's latest declaration, "it continues to increase in size, or at least does not diminish; and its convoluted wall assumes the strong, yellow hue which has given rise to its name. At the same time, the central clot becomes fully decolorized without losing greatly in substance, growing denser and firmer in proportion as it diminishes in bulk. Consequently the corpus luteum, by the end of the second month, appears as a voluminous yellow envelope, surrounding a white, tolerably firm, fibrinous coagulum. . . . The whole forms a flattened, roundish, or ovoidal mass, of sufficient consistency to be felt as a well-defined tumor in the substance of the ovary."

"Beyond a certain period of pregnancy, the date of which is not precisely known, the corpus luteum diminishes in size, and loses the freshness of its yellow hue. It still retains the characteristic features of its original structure, and the connection of its central clot with the surface of the ovary continues visible throughout. At the same time its

different parts become more closely adherent to each other, and the central clot often assumes the appearance of a whitish, radiating, or star-shaped, cicatrix-like mass. At the end of pregnancy the corpus luteum is reduced in volume to about one half of a cubic centimetre, and in weight to about five hundred milligrammes."

"The appearance of the ovaries is further modified during pregnancy by the disappearance of the earlier corpora lutea and the inactivity of the Graafian follicles." . . . "When gestation, therefore, has advanced to its middle or later periods, there is but one corpus luteum to be found in the ovaries. Those of a previous date have by this time disappeared, and no subsequent production of them has taken place."

The above copious quotations from the recent Report on the Corpus Luteum, by J. C. Dalton, M. D., present the most important of the diagnostic characters of this peculiar structure. Deviations from the appearances here detailed, however, sometimes occur, and as some of them have a bearing on matters of medical jurisprudence they will be briefly alluded to in the author's words: —

"One of the variations in the structure of the corpus luteum at this time 'during pregnancy' is due to the presence or absence of a central cavity in the fibrinous clot. As a general rule the clot is continuous and of uniform solidity throughout. But sometimes there is, in its central part, a well-defined cavity or excavation, with smooth walls, and similar in form to the clot itself." It has occurred, according to Professor Dalton's estimate, in about one third the whole number of published cases. "It seems to be due to a special retention of serum during the absorption of the clot. . . . It is not very plain why the same thing should not happen in the corpus luteum of menstruation, but, in point of fact, it does so very rarely. I have never seen such a cavity in the corpus luteum of menstruating women, and know of but one recorded instance of that kind."

A formation in the ovary which, although not a sequence of impregnation, may give rise to doubt as to its true character, unless clearly understood, is what is termed "saccular degeneration of the Graafian follicle." "This degeneration consists in a collapse of the follicle from reabsorption of its contents, together with slight thickening and condensation of its membranous wall. By this process the follicle loses its normal physiological character, and passes into a condition of permanent inactivity. . . . The healthy Graafian follicle is globular in form, and consists of a thin, flexible, vascular, nearly transparent membranous wall, enclosing a clear, colorless fluid. When undergoing the saccular degeneration, its wall becomes thickened, opaque, whitish, and somewhat rigid, as if assuming a slightly cartilaginous consistency. The follicle is also a little puckered; and as its fluid contents disappear it becomes collapsed, so that its opposite surfaces are in contact with

each other. It is still distinct from the adjacent ovarian tissue, and may be readily enucleated by the forceps, as in the healthy condition."

"In some cases the thickening of the follicular wall increases to 1.5 or two millimetres, and the degenerated follicle then presents an appearance of unusual solidity." "In size the degenerated follicles usually measure from three to five millimetres. Sometimes," as in a case mentioned by the author, "their longest diameter may reach eight millimetres." In the case alluded to, the wall of the follicle was "of a dead-white color, firm, and nearly homogeneous in texture, not distinctly convoluted, but enclosing an empty cavity with irregular, zigzag outlines. Its volume was 0.15 cubic centimetre, and its weight seventy-seven milligrammes."

"Such a formation as this is the only structure which deserves the name of a 'false corpus luteum.' It could hardly be mistaken, however, for a genuine corpus luteum except on very superficial examination. The most obvious distinction between the two is as follows: The real corpus luteum is superficial in situation. It is formed from a ruptured Graafian follicle, and its central cavity, with the contained clot, is always connected with a cicatrix on the surface of the ovary. The 'false corpus luteum,' on the other hand, is a Graafian follicle which has never ruptured. It is often deeply seated in the substance of the ovary, and it is not connected with any external cicatrix. The white color of its puckered wall and the absence of any clot or residuum in its central cavity are additional marks which serve to fix its character."

Other irregularities in the appearance of the corpus luteum which are sometimes met with, and with which the medical examiner should be familiar, are in some instances due to causes connected with the establishment or cessation of the function of menstruation, and in others to morbid changes which have taken place in the Graafian follicles. They need only be barely mentioned here. For a study of them the reader is referred to works on the subject, and especially to Professor Dalton's published reports. They appear, however, to be associated with abnormalities of menstruation, and to be mostly, if not wholly, independent of pregnancy. Thus, "menstruation may take place without the rupture of Graafian follicles or the formation of corpora lutea;" a corpus luteum may be formed "without the central clot;" "hæmorrhage" may take place "into a Graafian follicle or the ovarian tissue without the formation of corpora lutea;" "blackish discoloration in and around old corpora lutea" may occur, and "gelatinous and fibrinous exudations into the cavity of Graafian follicles" may be sometimes found. These morbid exudations occasionally occupy as much as half the space of the entire ovary. Concerning the blackish discoloration, it is important to know that it is seen only in retrograde corpora lutea of menstruation. For, says Professor Dalton, "in most instances, as the corpus luteum

passes into a retrograde condition the central clot becomes semi-transparent and of a lighter red color, afterward of a mottled greenish or slightly brownish hue, and at last is completely decolorized. The blackish tint in question shows itself only in very old corpora lutea, which have become much reduced in size, and shriveled or compressed."

Although Professor Dalton, with his characteristic carefulness of statement, does not in his paper inform us at what period of pregnancy the corpus luteum arrives at its highest stage of development, — a point of considerable importance to the medical jurist, — yet we are not without some information on this matter. On reference to his work on Human Physiology, we find that in comparing the corpus luteum of pregnancy with that of menstruation he gives the size of the former at two months to be seven eighths of an inch (twenty-two millimetres) in diameter, and at six months "still as large as at end of second month." Later observations, however, may have changed his opinion in this particular. M. Coste, who has had rare opportunities for studying this subject, is quoted by Professor Austin Flint, Jr., in his Physiology of Man, as saying: —

"I have followed with the greatest care, in the pregnant female, all the phases of this retrocession of the corpus luteum of pregnancy. This commences to be really appreciable toward the end of the third month. During the fourth month the corpus luteum diminishes by nearly a third, and toward the end of the fifth, it is ordinarily reduced one half. . . . Nevertheless, there is nothing absolute in the retrograde progress of this phenomenon. I have seen women dead at the sixth and even the eighth month of pregnancy, present corpora lutea as voluminous as others at the fourth month."

The inference from these references is that during the third, fourth, and fifth months of pregnancy the corpus luteum is in a high state of development. As abortions, especially criminal abortions, are most likely to occur during these months, any evidence which can be derived from the existence of a corpus luteum will then be of its greatest value, because less liable to be misinterpreted.

At the autopsy of a woman supposed to have come to her death in consequence of a recent abortion, at a period from the third to the sixth month of pregnancy, an examination of the corpus luteum, if discovered, should be made in reference to the following anatomical and diagnostic signs: (1) location; (2) size; (3) texture; (4) glandular wall; (5) clot; (6) enucleation.

(1.) The location in the ovary should be superficial, as indicated by a prominence on the surface of that organ, and by the existence of a minute opening or cicatrix which marks the point of rupture of the Graafian follicle whence the corpus luteum originated. If the structure is deep seated, and unconnected with a depression or scar on the ova-

rian surface, it is not to be considered as an evidence of pregnancy, but should be regarded as the result of gelatinous, fibrinous, or saccular degeneration of an unruptured Graafian follicle, — a so-called "false corpus luteum."

(2.) Unless defective in development, on account of local or general deficiency of organization or vigor, or on account of retrograde changes which took place between the events of abortion and death, we should expect the corpus luteum at this middle period of pregnancy to measure in its length from ten to twenty-five millimetres, in its weight from five hundred to fifteen hundred milligrammes, and in its volume from one half to one cubic centimetre. Normally retrograde corpora lutea of menstruation usually fall short of these measurements.

(3.) The texture of the corpus luteum of pregnancy is usually quite firm, sometimes almost cartilaginous in consistency, especially the clot, while that of corpora lutea unconnected with pregnancy is soft or only moderately firm, and, after the first month, even friable.

(4.) The wall of the corpus luteum when followed by impregnation is of a more distinctly bright orange-yellow color, thicker, and more deeply convoluted than when conception has not taken place. The yellow color which then obtains is often described as rosy yellow, light yellow, yellowish-white, an indefinite yellow hue, and the convolutions are less deep and thick according as the occurrence of menstruation has been recent.

(5.) The clot of the corpus luteum is one of its most distinctive features. During its development in pregnancy it becomes more and more decolorized and firm in texture, and towards the end of the term puckered and scar-like. In about one third of the cases it is found to contain a central cavity devoid of lining membrane. This characteristic may be regarded as almost certainly diagnostic of recent pregnancy. In the non-pregnant state, however, the color, which during the first month is red, changes to greenish, brownish, or whitish, only when the retrograde process has become well established, — when its size has begun to diminish and its consistence to soften.

(6.) Enucleation is one of the properties which pertain to corpora lutea. Not only in the well-developed structure can the clot be removed from its enveloping wall, but also the whole body can be readily separated from the stroma of the ovary by a sort of natural cleavage. This characteristic of the corpus luteum belongs alike to that of pregnancy and that of menstruation during the developmental periods. This difference, however, obtains: that when the latter has undergone an early stage of retrocession, or become obsolete, its separation of parts or its entire separation from the ovary is difficult, if not impossible, without rupture; whereas the corpus luteum of pregnancy can be at all times enucleated from its bed in the ovary, and, as a rule, the clot can be removed from its capsular integument.

In regard to the medico-legal value of a well-marked corpus luteum of pregnancy as an evidence of abortion, it seems to me there can be no doubt. As much weight should be attached to its existence as to that of any other single sign, unless, perhaps, the mark of the utero-placental union. It sometimes, however, happens, as in the case already referred to, of Dr. Chenoweth, that on account of instrumental violence at the hands of an abortionist, followed by inflammatory softening of the uterine wall at the seat of injury, complete obliteration of the placental site occurs, thus destroying any evidence to be derived from this source. In this case when the uterus "was first held up there appeared to be three ragged rents on the front part close together, looking like a torn carpet, with the shreds reaching across the rents." "After having been slightly touched with a sponge the rents in the uterus disappeared, leaving a large excavation." "I do not doubt," he says, "that the placenta occupied the site of the rents." In other instances, as when due to the lapse of a considerable interval of time between the abortion and death, all traces of the seat of this organ have been removed by absorption or exfoliation.

Although some writers on medical jurisprudence are inclined to attach small importance to the existence of a corpus luteum as a proof of recent abortion, yet I think I may say the latest and best informed on this subject generally regard it as of very considerable value. Evidently the weight given to this sign depends very much upon the care with which the examining physician conducts his examination, and upon his ability to interpret correctly the appearances which he discovers. There is reason to believe that most of the reported cases of so-called "true corpora lutea" in virgins, and their absence in women after delivery, are attributable either to a want of discrimination between the yellow body when dependent upon ovulation alone and that dependent upon ovulation followed by conception, or to an inability to recognize that structure when imperfectly developed from any cause, or when deteriorated by changes which have taken place in it after abortion occurred. Attention to the points detailed above, it is believed, will seldom mislead the careful observer. It is to be hoped that medical examiners will give this subject careful attention, and report their results to this society, in order that a more thorough knowledge of all the important phases and appearances of this organism may be more thoroughly understood.

The following conclusions arrived at by Ogston tally well with what I have derived from other sources: —

(1.) "That a small, imperfectly developed corpus luteum affords no proof of impregnation having taken place.

(2.) "That in proportion as the corpus luteum approaches its full size and development, so does the proof of impregnation followed by a somewhat advanced pregnancy approach to anything like certainty.

(3.) "That the absence of a corpus luteum from the ovary would not be sufficient to negative the possibility at least of impregnation having taken place.

(4.) "That the differences in which the distinction between spurious and true corpora lutea is based do not refer to separate bodies so much as to different states of the same body."

The following case, copied from Professor Dalton's report, already borrowed from, illustrates so well many points which have been described that I make no apology for its introduction here: —

"CASE XXIII. A colored woman, twenty-five years of age, rather below the medium height, but strong and well developed, died in New York, April 7, 1877. She had had an abortion, without medical attendance, nine days before, and attempted to conceal the fact until she became ill, several days afterward, and was seen by a physician. She reported to him that she had been not more than two months advanced in pregnancy. From her appearance, as observed by her friends, the pregnancy might have been as early as this, but could not be as late as six months. From the condition of the uterus, as seen at the autopsy, it should probably be reckoned at three months. Death resulted from general peritonitis.

"The uterus was enlarged to more than five times its natural size; weighing, when stripped of all accessory parts, two hundred and seventy-four grammes, its walls being thickened in proportion. The mucous membrane of the cervix remained entire. That of the body was wanting throughout; and at the upper part of the posterior uterine wall the former attachment of the placenta was indicated by a ragged, brownish prominence, forty to fifty millimetres in diameter and three to five millimetres in thickness.

"The situation of the corpus luteum, in the right ovary, was distinguishable externally by a roundish, superficial cicatrix-like spot surrounded by an indistinct yellowish zone. The corpus luteum, immediately beneath, was fifteen millimetres wide, ten millimetres deep, and five millimetres thick. Its outer wall was of a clear, orange-yellow color, quite thin in its superficial portions, one millimetre thick elsewhere, but often increased by its foldings to a thickness of two millimetres. The central clot was of firm consistency, uniformly decolorized, and white for the greater part of its extent. Immediately beneath the superficial cicatrix it presented some dark bloody discoloration, apparently due to the inflammatory congestion of the ovarian integument, which was strongly marked. In the centre of the fibrinous coagulum was an oval excavation of flattened form, without any separate lining membrane. The whole corpus luteum was easily enucleated. Its volume was 0.9 cubic centimetre and its weight 1015 milligrammes.

"The left ovary, which was smaller than the right, contained nothing unusual. In each organ there were a number of Graafian follicles, from one to three millimetres in diameter, beneath the albuginea. There were none of larger size, and none prominent on the surface."

Although it would be in all fatal cases extremely desirable, and in most of such cases quite possible, to decide upon the occurrence of recent abortion by strictly post-mortem appearances, yet, fortunately, medical examiners are seldom compelled to rely entirely upon such proof. They are required by law to make "personal inquiry into the cause and manner of the death." It rarely happens that circumstantial evidence, or that obtained from a history of the case as given by trustworthy parties acquainted with the woman when living, or that derived from the general reputation of the woman, is not available for medico-legal purposes. It is obvious that in case of death following abortion, an opinion based upon medical examination should not be dependent upon any single sign, but rather upon the coexistence of several of them. While a distinct placental mark existing in a uterus considerably enlarged might in itself be sufficient indication to satisfy the examiner of the fact of recent delivery, yet if to this testimony could be superadded that arising from the existence of a well-developed corpus luteum, no further proof, it seems to me, should be required to satisfy any legal tribunal.

It only remains to allude to the evidences of abortion at a remote period. This can seldom be diagnosticated by physical signs alone. After delivery at the full time the normal process of involution is completed in about one month. Although, as we have seen, the uterus under these circumstances does not wholly return to its original condition, and can be recognized as having been pregnant, yet after an abortion in the early or middle periods the differences in this respect would be hardly perceptible. If death followed criminal abortion after a month's time or more, in consequence of inflammation which was thereby set up, this "inflammation might or might not be attributed to this source."[1] When peritonitis is the result of violence it is, according to the authority of Woodman and Tidy, "generally more localized than when it is spontaneous in puerperal cases." The forms of inflammation which are most likely to ensue are metritis, phlebitis, pelvic peritonitis, and pelvic cellulitis. The original lesion is generally endometritis, which probably results in many cases from some injury inflicted upon the womb by the abortionist, or from want of proper care after the abortion occurred. "We have reasons for believing," says Fordyce Barker, "that puerperal metritis is frequently the primary lesion in many cases of general or local peritonitis, and in many of the suppurative inflammations of the other pelvic tissues."

[1] Ogston.

The following case, which came under my observation ten years since, is an instance in point: E. B., aged twenty, unmarried, underwent two "operations" at the hands of an abortionist. No pain attended the first attempt, which was a failure. At the second, about a week after the first, she was "hurt dreadfully," as she subsequently stated. Immediately before and after each operation she walked a distance of two or three miles. Expulsion shortly followed the second manipulation. No physician was in attendance. She was said to have suffered severely, but apparently made a good recovery. At the end of a month she was removed to the residence of a near relative, some three miles distant, being conveyed in a carriage. From this time up to that of her death she underwent two transportations from place to place during cold winter weather, and is further believed to have suffered many hardships from neglect and abuse. It is known that for more than two months before the fatal event occurred there was a purulent discharge from the rectum, with emaciation, hectic, and general prostration. Death occurred four months after the abortion.

At the autopsy there was found in Douglas's pouch a purulent cavity four or five centimetres in diameter, with rigid walls formed by adhesions of the pelvic peritoneal tissues, and connected with the rectum by a fistulous opening some seven millimetres in diameter. The uterus was healthy to appearance, and being submitted to Professor J. B. S. Jackson, he could detect no positive trace of primary lesion, although there was an appearance which might have been the result of a puncture. No evidence of disease was found in other organs.

Before death the young woman made a dying statement, which was duly sworn to. The abortionist, who was a woman, was prosecuted, tried, convicted, and sentenced to eighteen months' imprisonment in the house of correction. After serving seven months and twenty-four days of her sentence she was pardoned by the governor.

REPORT OF THE EXECUTIVE BOARD

ON THE WORK OF THE MEDICAL EXAMINERS FOR THE YEAR 1878.

THE executive board has the honor to report that of the sixty-two medical examiners who are members of the Massachusetts Medico-Legal Society, forty-two have reported their work for the year 1878. Of these, twenty-one have sent *complete* returns, — in other words, they have reported all their cases in detail, as well as made their "annual return;" two have made no annual return; nineteen have made no reports of cases; one sends an incomplete return of autopsies only.

From the forty annual returns it appears that the

Number of views made has been	828
Number of views followed by autopsy	196
Number of autopsies refused by authorities	none
Inquests held (included in foregoing): —	
(*a*) on recommendation of medical examiner	171
(*b*) without his recommendation and not in railroad cases	1
Inquests at which medical examiners testified	96
Cases reported by medical examiners as probably resulting from violence, in which no inquest was held	16
Deaths from natural causes	328
Fatal railroad accidents	117
Other fatal accidents	214
Deaths from suicide	92
Deaths from violence at the hands of others	68
Prosecutions resulting	30
Convictions resulting in cases finished	19

Comparing these figures with those for the six months, July to December, of 1877, during which the new law was in operation, we find the following: —

	In six months of 1877.	In 1878.
Views	443	828
Autopsies	116	196
Inquests	99	172

The relative proportions of views to autopsies and inquests vary but little for the two periods. When we compare the causes of death we find a difference in favor of 1878, thus: —

	Percentage in six months of 1877.	In 1878.
From natural causes	23.	39.6
" railroad accidents	17.3	14.
" other accidents	29.	25.8
" suicide	16.	11.
" violence proceeding from another	11.	8.2

The *percentage* of convictions to prosecutions was in six months of 1877 23.8; in 1878, 63.

In attempting to carry our analysis further, we encounter the same difficulty as before, namely, that of the "views" appearing on the annual returns but five eighths have been reported in detail. From the northern district of Suffolk, from Lowell, and from Cambridge, we have no "reports of cases." But from the five hundred and fifteen cases which have been duly returned to the corresponding secretary, it appears that of forty-three suicides there were by

Shooting	15	
Hanging	8	
Drowning	7	
Cut throat	5	
Laudanum	4	Poison, 7
Arsenic	2	
Oxalic acid	1	
Leaping from window	1	

Of the above, one took laudanum before shooting himself; one shot himself before cutting his throat; another tried hanging and shooting before he cut his throat. Two suicides first attempted murder, in one case successfully. One of the suicides by arsenic was an arsenic-eater. Ten suicides were known to have been insane.

Of seventy-eight accidental deaths, not by railroad, —

37 were by drowning (4 following shipwreck).
2 from asphyxia by coal gas.
2 from asphyxia by illuminating gas.
2 from suffocation in a well while blasting.
6 from falls.
7 from falling bodies.
5 run over by horse or vehicle.
1 by explosion of nitro-glycerine.
3 from machinery in motion.
1 from arsenic.
2 from scalds or burns.
1 from overlaying in bed.
5 from shooting.
1 from incised wound.
2 from freezing and exposure to cold.
1 from lightning stroke.

Of still-born infants and infants less than one week old, there were thirty-nine. Fifty-two deaths were reported as the direct or indirect result of intoxicating drinks.

Of deaths reported as by violence (proceeding from another), —

10 were caused by assault with axe, club, iron bar, or other instrument, producing injuries of the head.
4 by shooting.
2 by drowning.
2 by infanticide.
2 by cuts with knife.
1 by injury of bladder.
9 by criminal abortion, or attempts at the same (1 by oil of cedar; 1 by oil of tansy; 1 by turpentine injected into the uterus; others by instrumental or other means).[1]

[1] Three of these deaths were through the malpractice of Mrs. Hayes, of Malden, and in one case of death following her practices the autopsy showed that pregnancy had not existed.

One view was made upon a human leg found on the sea-coast, but not included in the examiners' annual summary.

One noteworthy point of difference between our Massachusetts reports and those from England, and also the mortality reports of our Southern States, is in the number of cases of infant suffocation in bed,— one only appearing in our reports for 1878; while in a single year one English coroner held ninety inquests on children "overlaid," or suffocated in bed. Most of these English cases occurred on Saturday night. In eight years three thousand six hundred and six were "suffocated by bed-clothes."[1]

Under the *régime* of the medical examiner, many cases of malpractice among irregular practitioners are brought to light, which would have been covered up or slurred over under the old coroners in the large cities.

If the three hundred and thirteen cases, of which we possess no more detailed knowledge than can be gathered from the annual summaries, had been duly reported to the corresponding secretary, and if to them had been added the cases of the twenty members who have neglected to make any return to this society, we should have nearly twice as much material to compare and analyze. The lessons deduced from this larger experience would be more valuable, and probably more trustworthy. If every member would overcome his indifference or his indolence, and report each "view" promptly, thoroughly and methodically, it would be found to the advantage of the whole society, quite as much as to that of the secretary, since no man who does thorough and methodical work misses the satisfaction of finding that he has grown by such work.

Of the relative expenses of the coroner and the medical examiner no exact statement can be made at present, — the fees being paid by various officials, whose accounts have no connection one with another, and who report to no common centre. For views, autopsies, traveling expenses, and a portion of the burial expenses the county treasurer pays, while the expenses of inquests are paid in part by other officials connected with the courts. But those who, in different counties, have made, independently of each other, attempts to ascertain the cost entailed by the new system as compared with that of the old agree in estimating that it is from a quarter to a third less under the new than under the old.

In conclusion, the board wishes to acknowledge the very friendly and valuable assistance received from Dr. S. W. Abbott in making up this report. He took the burden at a time when the corresponding secretary was overworked and far from well.

[1] Fourth Report Massachusetts Board of Health (1873), page 217.

MEDICAL EXPERT TESTIMONY:

WHAT IT IS AND WHAT IT SHOULD BE.[1]

PART I. WHAT MEDICAL EXPERT TESTIMONY IS.

THE committee having in charge the subject of medical expert testimony have considered the topic, and discussed many of the issues which it presents. It has been found too extensive and difficult to be exhausted, or even matured into any satisfactory conclusions, in the time which they have had at their command, and it became apparent to them that it would be impracticable to present any results within the limit allotted them in the arrangements for this occasion. They were compelled, therefore, to the necessity of asking a postponement of what was properly expected of them to a future meeting of the society. In doing this, however, they remark briefly upon the first branch of their inquiry, *what expert testimony is* at present; leaving the consideration of *what it should be* for a subsequent paper.

It is beyond controversy that this important branch of evidence, as used and applied in the courts, is open to many causes of objection and criticism. That it is also subject to many abuses, and is often a hindrance rather than a help in the administration of justice, is unquestionable.

The most conspicuous fault in this class of testimony is its evident partisan ship. Even in regard to questions which are scientific in their character, and where it would seem to be possible either to declare and apply positive results or to admit that such results are not yet reached, experience has shown that men of respectable attainments and sufficient skill array themselves in antagonism, and vehemently support or attack one side or the other of the issue of a cause. Called upon to express an opinion upon an assumed or proven state of facts, and where, weighing and applying the facts with judicial fairness, only one conclusion would appear to be possible, exactly contrary results are given by men who apparently stand equally qualified as witnesses. And it is found that when one or the other of these is tested or pursued by the fairest method of cross-examination, he espouses the cause of the side which has called him; so that it at once appears that he is retained for that side, and comes to support it in all emergencies, disregarding the demands of absolute truth in the desire for personal success or partisan victory in that especial trial. That there are exceptions to this course is true, but in the large majority of cases

[1] At the February meeting of the Massachusetts Medico-Legal Society, a committee was appointed, consisting of Attorney-General Marston (chairman), Prof. H. P. Bowditch, M. D., T. H. Tyndale, Esq., A. E. Pillsbury, Esq., Medical Examiner Y. G. Hurd, M. D., and Medical Examiner F. W. Draper, M. D., to report upon the subject of medical expert testimony. At the meeting, June 10, 1879, the committee reported upon the first part of the subject, and further time was granted in which to complete the work.

the experience has been as above described. Those who have been familiar with some of the most important trials in this State have had occasion to see what ought to have been an inquiry to be determined with absolute accuracy as far as science has reached, and left undetermined as to what is beyond, degenerate into a mere personal contest between disputants who were called as experts on different sides, and disposed of as the preferences of jurors inclined to the method or manner of one or the other of the litigant witnesses.

This has often been because men called to testify have regarded themselves as retained on the one side or the other. The remark of Rufus Choate, that in an action concerning real estate it was first necessary to "retain a surveyor," was a recognition, out of his experience, of the fault and defect of administration of which we have spoken. And it is matter of common knowledge that in other departments of art or science than surveying it is the daily practice to employ, as if retained, expert witnesses, who are expected to take the same relation to the cause in hand as the counsel who are to try it. Witnesses thus engaged have allowed themselves to form opinions upon a partial and one-sided presentation of the facts, and, having formed the opinion, have persevered in defending it after other modifying facts have appeared. The verdict has often depended more on the skill and ingenuity of the witness in maintaining his theory than upon the soundness of his position.

Another mischievous result of expert testimony, as it is, has been the employment of pretenders and charlatans where only men of real learning and just perceptions of duty could aid in reaching correct conclusions. The effect has depended in such cases not so much on what the witness knew as upon what he claimed to know; and if he has been sufficiently conceited and voluble to evade the search of cross-examining counsel, or to confuse unscientific jurors, or, oftener, to commend himself to the prejudices or theories of men who have happened to sympathize with his views, the object of calling him has been attained, and justice has been defeated. And in respect to the large number of cases, constantly in the courts, where physical injuries have been suffered, a dishonest and mercenary plaintiff can often deceive an unscientific physician as to the presence of symptoms, and simulate a case that does not really exist. If the patient has misled an adviser of such a character, the latter will be little likely to admit his errors of diagnosis when he is called to the stand, and may be expected not only to persist in his mistakes, but to exert himself resolutely and as adroitly as possible to hide and overcome them.

And it also frequently happens not only that the witness is employed as a partisan, or is afterwards disposed from pride of opinion to defend what he ought to see is erroneous, but also that his compensation is left to depend upon the result of the trial. It follows, of course, that he has thus a pecuniary interest, which creates a controlling bias. While he appears on the stand as a scientific expert, he is, in fact, practically a party to the suit. He has been such from the beginning. He has examined the subject and constructed his opinions from that stand-point, and, affected by that perversion, the bias and intent which he had at the outset are intensified as the contest goes on. If, as not unfrequently occurs, there are several trials, he inevitably becomes more deeply interested and more perverse. And while the court and jury

are looking to him as one who may aid in ascertaining the truth, he is constantly leading them in the other direction.

There are also those employed as experts who, while they do not lack in ability, are wanting in integrity, — who espouse a theory with no regard to conscience or justice. These are not misled by interest, or bias, or error, but intentionally undertake to defend a position with no regard to truth or consequences. Cases of this sort are not frequent, but they are not unknown. When such testimony assists in securing a verdict, the result is a reproach to the administration of the laws.

Fortunately, there is no difficulty in obtaining expert witnesses who either are not obnoxious to any of the complaints which we have made, or are as free from them as the lot of humanity will admit. But there is no system or method in law by which their services can with certainty be applied. The party who is able to pay such compensation as such men are fairly entitled to demand and receive may secure their assistance. Those who cannot do this will resort to some of the ignoble ways which have been noticed. There is no adequate provision of law which regulates or directs the procurement of that which is desirable, or which prevents the employment of that which is detrimental. Whether any legislative enactments are available and can be made efficient to remedy the mischiefs of which your committee has spoken, and what other means of improvement in these matters are practicable, must be left for future consideration.

PART II. WHAT MEDICAL EXPERT TESTIMONY SHOULD BE.[1]

In discussing "what medical expert testimony should be," the latter division of the subject upon which we are called to report, and the means by which its character may be improved, it is necessary to keep constantly in view the evils against which we seek to provide. As some time has elapsed since the former report was presented, it may be allowable to recapitulate briefly the objectionable features of the present system.

As expert testimony increases in volume with the increase of litigation and the progress of science, the practical difficulties attending its use become more noticeable. The comments which may be made upon the present method of obtaining it apply with equal force, perhaps, to the testimony of experts in all departments of art and science; but from the fact that medical experts appear in the courts, both civil and criminal (if we except the trial of patent causes), with greater frequency than those of any other specialty, the public and professional attention and criticism have been directed chiefly to them. It is not too much to say that the impression is now general among the members both of the medical and legal professions that medical expert testimony to almost any effect can be purchased in the market as readily as one may purchase a horse, and, to extend the simile, with as little assurance of soundness. The system which makes the medical expert a hireling has an irresistible tendency to make him a partisan; and in this unfavorable light will the expert, even of the highest character, stand liable to be regarded, at least by the eye of suspicion, so long as the present system obtains. As was natural, the attention of doctors and lawyers was first attracted by the existing abuses. As a conse-

[1] Reported to the Society at its stated meeting, October 1, 1879.

quence of their observation, many of the most respectable physicians, humiliated and indignant at seeing their honorable calling prostituted to such base uses, are unwilling, if they do not refuse, to go upon the witness stand in contact and competition with mountebanks and empirics; while the lawyers, losing their respect for the class, in view of the delinquencies of individuals, have been led to indulge in much censorious criticism and occasional rough treatment of medical expert witnesses. If this were all, there would be less occasion for complaint. But in these days nothing escapes the omniscience of the newspapers and the public. A knowledge of the weaknesses of the present system has gradually permeated the whole community; and the views and opinions of professional men upon this subject have come to be so largely shared by the classes from which jurors are drawn that it is questionable whether, even now, the production of medical expert testimony in court does not in a majority of cases fail of its object, through the inability of juries to decide, where so many doctors disagree, or their indisposition to pay heed to any, where all are equally positive and many certainly wrong. In this state of things the professional mind is led to the conclusion either that some improvement upon the existing method must be devised, or that, in the practical administration of justice, it is better to forego all benefit of scientific or special knowledge upon the subjects to which expert testimony is usually applied rather than to allow courts and juries to be confounded and misled by a mass of confused and contradictory testimony, about which we can be sure of nothing save that it is hired and paid for.

In attempting to reform the present system, it is necessary first to look carefully for the sources of its weakness. Its most objectionable feature is that our medical expert, miscalled a witness, is really an advocate, and of counsel in the cause. The Roman law regarded the expert witness as *amicus curiæ*, a trusted and impartial assistant to the court, whose duty was to be performed in the strictest spirit of judicial indiscrimination. That he should be such is apparent when we remember how much closer is the analogy of his function to that of the judge and jury than to that of the ordinary witness. In our courts and under our practices, the expert witness is merely a skillful master of fence, employed to thrust and parry. It is but just to say that this is less the fault of the witness than of the system; nor is it necessarily a reproach to the witness, in view of his situation, that he is affected with bias. He is chosen by the litigant, from among numerous competitors, to render him a lucrative service. He is fully consulted beforehand, is acquainted with the theory which his employer's interest requires him to establish, and knows that unless his testimony supports that theory he will lose the opportunity of employment. Interest and perhaps sympathy, ornaments of human character but foes of impartial judgment, are awakened in his client's cause. On coming into court, he finds himself arrayed against his eminent and learned brother on "the other side," and his personal and professional pride, if no less generous passion, is aroused. He is rather roughly handled by cross-examining counsel, who deal with him as an open enemy, and the spirit of antagonism excited by his situation combines with his zeal and pride of opinion to carry him beyond the bounds of truth and of decorum.

We are aware that physicians who are called to the witness stand as experts

are usually honorable and high-minded as well as learned and skillful men, self-respecting and regardful of reputation. Either of these checks would commonly be enough to restrain the witness from practicing, in his position, the arts of the advocate; but it is practically impossible for him, even if his intentions are the best, so to divest himself of the prejudice which the character and mode of his employment naturally engender as to perform his office with entire impartiality. The very relations between him and his employer affect him with a bias, of which he may indeed be unconscious, but the influence of which he can hardly escape. It is a natural impulse to return a consideration for his fee. Even a dog licks the hand that feeds him. This impulse, with the spirit of partisanship which a hotly-contested trial will arouse in every member of the hostile forces, as lawyers know, and the desire to vindicate himself against the assaults of counsel and witnesses upon the other side, overturn the judicial equipoise of his mind and divert his steps from the straight track of the seeker after truth. It is hardly surprising, such are the frailties of human nature, that the system leads to this result; but the fact remains that any system which produces or admits of such consequences must be of little value as an aid in the administration of the laws. The avowed advocate is harmless. The poison is drawn from his fangs by the common knowledge that he is hired and paid to present his client's cause in the most favorable light. But justice has no more deadly foe than an advocate in the guise of a witness.

Another point should be noticed. From the custom of allowing medical expert witnesses to be hired and paid by litigants, it frequently results that the disparity of the parties in pecuniary means places a deserving suitor at a serious disadvantage, and imperils and occasionally defeats a meritorious cause. This is upon the assumption, generally practiced upon in Massachusetts and, it is believed, throughout the United States, with the exceptions hereafter noticed, that the law does not require a medical witness to give in evidence his opinion as an expert without compensation as for a professional service. This rule has been much discussed, and some diversity of opinion has arisen upon it. The Supreme Court of Indiana, though by a majority only of the judges, has declared it to be the law of that State; the Supreme Court of Alabama hold the contrary; while one, department of the Supreme Court of New York (not the court of last resort), has attempted to divide the rule, saying, that while an expert witness is bound to attend upon subpœna, and to "give proper impromptu answers" to all questions proposed to him, including matters of opinion, he is not bound, without special compensation, to examine the case, nor "use his skill and knowledge to enable him to give an opinion." This remarkable decision seems to recognize that there may be an expert opinion involving neither skill nor knowledge; which, if true, may account for some "opinions as is opinions" of eminent experts, which have heretofore been held incapable of explanation. In this state of the authorities, with one court on each side of the question, and a third apparently half on one side and half on the other, the law can hardly be taken as settled; but it is believed that in Massachusetts, if the question is ever presented for adjudication, the right of the expert witness to special compensation will be sustained. Some degree of dissatisfaction has prevailed among lawyers and litigants in this State at the charges of medical experts; but it is probably due less to the exaction by duly qualified experts of a fair remuneration for their time and trouble than to the circumstance

that competent and incompetent men alike demand for their services a price which often is wholly disproportionate to their value. A custom has arisen in this vicinity among medical experts of the first rank to require remuneration at the rate of fifty dollars for each day's attendance in court; which charge is supposed to cover the necessary preliminary examination and research, if any, as well as the work of the court-room. Other and sometimes very ill-qualified members of the profession, following in the wake of their leaders, if called as experts, as by some principle of unnatural selection they occasionally are, instead of complementing the paucity of their attainments with modesty in their charges, demand the same fees for a service which would be dear at any price. This ground of complaint might disappear if both doctors and lawyers would bear in mind that a license to physic the bodies of men does not necessarily qualify one to inform their minds. It will hardly be denied that the rule which gives an expert witness extra compensation is well founded in reason, yet under the present system its enforcement is liable to fall with heavy weight upon deserving suitors. As medical expert testimony cannot be brought into court by the process which commands the attendance of the ordinary witness, but must be purchased and liberally paid for, a plaintiff or defendant of small means, though having the truth on his side, is placed at a serious disadvantage, and may, at the end of an unsuccessful trial, find the reason of his defeat less in the justice of his adversary's cause than in the length of his purse. Nothing is more common than to find this inequality in the command of means between the parties to a suit; and, taking into account the multitude of so-called "negligence cases" against cities, towns, and railroad corporations, in which, almost without exception, medical expert testimony is employed, it is not unreasonable to suppose that this disparity of resources exists in a large majority of all the cases involving medical expert testimony in the courts of this commonwealth; and this inability of one of the parties properly to equip himself, in this respect, for the trial of his cause is liable to result in an absolute failure of justice.

But below this deplorable depth, to which the consequences of our imperfect system occasionally descend, there is yet a "lower deep." We will suppose that a suitor lacks the wherewithal to employ and pay physicians of proper character and qualifications for the performance of expert service. The medical question may be an important and controlling element in the case, and, knowing that his adversary, better provided with the sinews of war, will come into court with a formidable backing of experts, against whose testimony he must offset other testimony of the same character, or abandon the hope of victory, he is driven to enlist the necessary professional witnesses upon promise of liberal remuneration in case of success, with the implied alternative of no remuneration at all in the opposite event. We have no reference here to the numerous cases in which this proper charity is worthily bestowed by physicians, often of the highest character, to aid a deserving cause. It is to the credit of the medical profession that to such the services of its worthiest members are frequently given without hope or desire of reward. But it is common knowledge among lawyers that the services of medical gentlemen, even of high reputation for learning and skill, can be commanded, under the circumstances here indicated, in any case which offers a fair prospect of a verdict against a responsible person; and it is no uncommon thing to see a liti-

gant march into court marshaling beneath his banner a body of these mercenary troops, attracted to the cause they serve, like seamen in time of war, not so much by the assurance of wages as the possibility of prize. It would be too much to expect of medical experts who go before the jury under this manifest disadvantage, that they should stand upright. So far from maintaining even an outward show of equilibrium between the parties, they are from the moment of their enlistment mere advocates of the cause, outstripping even the zeal of counsel in their eagerness to secure the verdict on which their emoluments depend. They are, in fact, as they have been pithily characterized, stockholders in the enterprise; and the length to which they are sometimes carried by such influences is well illustrated by the remark of a late learned author, commenting upon the testimony of such on a question of insanity, that "in the light of the testimony of some of these experts, the wonder in some minds has been which was the crazier half of the world, — those inside or those outside the walls of Bedlam."

In criminal and especially in capital cases the usual inability of the defendant to command the service of medical experts may place him at a disadvantage totally inconsistent with the theory and policy of our criminal jurisprudence. The prosecuting officer, armed with the power and resources of the government, commands the whole field of science, and may call to his aid the foremost among her ministers. The prisoner is rarely in a position to avail himself of such assistance. In Massachusetts it is the statutory right of a person on trial for a crime punishable by death or life imprisonment to have the process of the government to compel the attendance of "such witnesses as are necessary to his defense;" but the opinion of the medical expert is, or is supposed to be, beyond the reach of this process. We would not conjure up any imaginary evils, nor magnify those which actually exist; and it should be said that it is, doubtless, very seldom, if ever, that a man goes to prison or to the gallows for lack of means to employ medical expert witnesses. The duty of prosecuting criminals is usually intrusted to just and moderate men, in whose hands the power of the government is not likely to be abused. Yet there is no guaranty of continuous excellence in office under our institutions; and it must be remembered that the protection against excessive zeal on the part of the prosecuting officer, which the prisoner generally finds in the impartiality of the judge, is liable to fail him at the point where he needs it most; since upon a recondite scientific question — and the more obscure the more likely it is to be controlled and decided by the expert testimony — the judge is presumably no better informed than the jury. It is the practice in Massachusetts, in capital cases wherein the government has occasion to employ medical expert testimony, to concede to the prisoner, if without means of his own, the privilege of employing medical witnesses, at a limited expense in the discretion of the attorney-general, to be borne by the State. But to compel a person whose life is at stake to rely for the means of his defense upon the counsel who is prosecuting him, however complete the safeguards with which he is surrounded in practice, is hardly consistent in theory with the humanity and liberality which we claim for our administration of criminal justice.

From this imperfect survey of the practical operation of our present sys-

tem of obtaining and applying medical expert testimony, we believe it is apparent that its chief defects may be traced to the fact that the expert is hired and paid by the contending parties respectively; that any effective reform of the present system must begin by placing the selection of the witness in other hands than those of either party to the action, and by providing for his compensation in such manner that the receipt of it will leave him free from any real or fanciful obligation to either party, and that neither may be debarred by lack of means from the benefit of his evidence. When this is accomplished it would seem that the radical imperfections of the present system are cured, and that those which remain may be safely left to take care of themselves.

It is improbable that a practical remedy, of any degree of completeness, can be achieved save at the hands of the legislature. Agitation of the subject may mitigate the disease, but statutory restriction alone can effect a cure. It is true that something might be done by the bench, the bar, and the medical profession, if unity of sentiment and concert of action could be secured; but most lawyers of largest opportunity for observation would agree that no thorough reform is likely ever to be reached through this channel. The judge presiding at a trial has power to pass upon one qualification of an expert, namely, the sufficiency of his special knowledge and experience, before admitting him to pronounce upon the questions at issue; and he may therefore, in any case, exclude a person who is manifestly unable to show himself qualified in these respects. But even this power is exercised rarely and with extreme hesitation; the usual practice, following the current of modern legislation toward enlargement of the rules as to the competency of witnesses, being to admit the witness to testify, however doubtful his fitness, leaving it to the jury to value his testimony as they think proper. But the eye of the court cannot penetrate the hidden defects of character or judgment which most disqualify for the exercise of this function. It may be said that this observation will apply in the case of all witnesses; but we are dealing with those who speak only to their opinions. The witness to facts, however corrupt, has upon him at least the check of a possible prosecution for perjury if he swear falsely, and the tests of cross-examination and comparison of his testimony with that of others will expose his error; but there is no guaranty of truth in expert testimony save in the learning and honor of the witness. And, while the powers of the court are thus narrow and incomplete, it is too much to expect of counsel, acting under the stimulus of hard-fought contests which involve his own reputation, feeling, and interest, as well as those of his client, that he should omit, from considerations of the general welfare, to draw any weapon that may be ready to his hand.

In the inquiry after a statutory remedy which shall include the selection of experts through any other agency than that of the parties, involving, of course, a power to limit their number, we are met at the threshold by a constitutional question. The constitution of Massachusetts (Decl. of Rights, art. 12) provides that "every subject shall have a right to produce all proofs that may be favorable to him." This article has reference only to the trial of crimes and offenses, as to which it may raise the inquiry whether it is not beyond the power of the legislature to debar the defendant from the production of any material and competent evidence. The testimony of a medical expert is un-

doubtedly comprehended by the term "proofs," and it is legal and competent evidence if it bears upon the issue. It may well be doubted, however, whether it was intended by this provision to impose upon the legislature a permanent and absolute prohibition against limiting the admissibility of evidence in criminal cases, which would be the effect of the construction above suggested. It seems to be a more reasonable interpretation to take the word "proofs" as meaning any proofs which are admissible in evidence by the law as it is in force at the time of trial. If this be the right construction, the difficulty is obviated. At the most, it cannot be said, in advance of a decision by the proper tribunal, that the unconstitutionality of a restrictive statute is so clear as to warrant the legislature in refusing to act, if such legislation seems to be demanded.

There is, however, a means of avoiding this objection. Whatever may be the meaning of the constitutional provision, it is not infringed by legislation which gives to the court or some other power the right to select the expert or experts who shall testify in the first instance, leaving to the defendant the right to call others if he sees fit. It is reasonable to believe that in most cases, under such a statute, both parties would be content to rest upon the unbiased testimony of the witnesses selected by the statutory method; and, if they were not, that these witnesses, probably physicians of high professional standing and free from any suspicion of prejudice, would be more likely to receive credit with the jury than those called by the parties, especially if the latter exhibited a disposition to take sides.

How and by whom shall the expert witness be selected? The various methods of obtaining expert testimony practiced under foreign governments, so far as known to us, afford but little aid in the solution of this question. In some countries of Europe official experts are appointed, like other members of the civil service, who hold this office continuously, and are called upon to testify as of course whenever the courts have occasion for their assistance. The idea of an official witness is odious, and, in this country at least, such a personage would be likely to share the obloquy which often deservedly rests upon professional detectives and common informers. It is believed that for many reasons this method neither receives nor would receive the approval of our community. Bearing in mind that the action of those most interested in the event of the suit should be interfered with no farther than is necessary to effect the desired result, we believe that the selection of the medical expert witness should be left, in the first instance, to the agreement of the parties, if they can agree. Their common interest would lead them to choose physicians of high professional standing and irreproachable character, or at least to approximate this as nearly as possible. If the parties differ, perhaps no better method can be devised than to allow the witness to be selected by a judge of the court in which he is to testify.

In providing for the compensation of the witness three objects are to be kept in view: to assure him a fair remuneration for his services, to relieve him from any pecuniary or other obligation to either of the parties, and to secure to each party, irrespective of his ability to pay, the benefit of this class of testimony when necessary. It is obviously difficult to accomplish all these results without touching the public treasury; and while this may prove a prac-

tical obstacle in the way of legislation, it seems to be essential to the purpose. We suggest that the witness be paid by the county, the amount of his compensation to be fixed by the judge presiding at the trial, and that the defeated party in the cause be liable to refund the amount to the county; applying to this expense the same theory, and putting the loser in the same position in respect to it, as to the other taxable costs of the action. In a period of retrenchment, when rival political parties are competing for the honor or privilege of paring closest from the public expenditures, this feature of the plan may not commend itself to legislative wisdom; but something at least may be said in its defense. The medical expert witness should be, and, under the proposed system, will be, an impartial assistant to the jury, called in practically to interpret certain facts, the proper appreciation of which is beyond the capacity of unskilled men; precisely as the assistance of an auditor is invoked by the courts, at the public expense, to determine certain questions in actions at law. As one of the aids employed in the proper administration of justice, there is good reason why his compensation should be made a public charge, like that of the judge and jury. The public will be reimbursed whenever the defeated party is of sufficient ability; and it is only in the other case that it seems necessary, in order to put both parties upon an equal footing before the courts, irrespective of pecuniary means, and to reach the other ends in view, that the public should be called upon to contribute this amount to the efficiency of its judicial system.

It is essential also to provide for the decision of the court upon the question whether medical expert testimony shall be procured if the parties do not agree as to the desirability of it, so that neither party may be deprived of it, when essential, by the refusal of his adversary, and that no one may be subjected to the payment of this charge, if neither in his own opinion nor that of the court it is necessary to a proper understanding of the questions at issue.

In order that gentlemen who have been frequently called as medical expert witnesses may be enabled to consider the proposed changes from the point of possible disadvantage, it should be suggested here that the courts may not allow the expert witness so liberal a fee as he has been accustomed to exact, or as he considers himself entitled to receive. This misfortune, if encountered, he would only share with many other members of the community. The ordinary witness to facts, or the juror, whose time may be as valuable as that of the expert physician, is compelled to serve for a fee which is hardly more than nominal. That the medical expert witness would be fairly remunerated there is no reason to doubt; and if, as occasionally might happen, a physician in lucrative practice were required to wait upon a trial to the detriment of his material interests, it would be but the sacrifice to good government for which every citizen, in one way or another, stands liable to be called upon.

We have deemed it desirable, in order that this discussion of the subject may advance as far as possible toward some practical results, to attempt the draft of a bill embodying these suggestions. The result of the attempt is presented herewith. Many minor difficulties are encountered in working out the scheme, and we have been unable to perceive how they may all be avoided. It is unlikely that a perfect system can be constructed save in the light of experience afforded by a trial of the experiment. The scope of this bill is confined to medical experts, as we are dealing with them alone, and as the practical diffi-

culties now arising from the use of expert testimony are most noticeable with respect to them. There is no reason in theory why such a statute should not include all expert witnesses, and no known objection to so enlarging its operation, if it should seem desirable. We are aware that the plan embodied in this draft is open to criticism, and that in addition to its obvious defects it doubtless contains others which its practical operation would disclose. It is submitted, with all its imperfections on its head, in the hope that it may at least be of service as furnishing a point of departure from whence the subject may be followed into the legislature.

AN ACT IN RELATION TO MEDICAL EXPERT TESTIMONY.

Be it enacted, etc.

SECTION 1. In any action, suit, or proceeding, civil or criminal, in which the testimony of a medical expert witness is desired by the parties, they may at any time before the trial file in the clerk's office a written agreement that such witness shall be summoned, designating him by name if agreed upon. The clerk shall thereupon issue a subpœna to the person designated, to be served in the manner provided by law. As soon as may be after service thereof the witness shall make such examination of the case as may in his judgment be necessary and practicable, and he shall attend as commanded in the subpœna and answer such questions as may be put in relation to the case.

SECTION 2. If no person is designated by the agreement of the parties, the court, or any judge thereof in chambers, or, in vacation, in any county, upon the filing thereof, shall designate a proper person, learned in the science of medicine, to be summoned as such expert witness, and the clerk shall thereupon issue a subpœna as hereinbefore provided. If the parties do not agree that a medical expert witness shall be summoned in the case, the court or judge, upon motion of either party and upon hearing, may determine the question, and may designate the person to be summoned, if any, as hereinbefore provided.

SECTION 3. Such witness shall be paid for his attendance, travel, and services a reasonable compensation, to be allowed by the court and paid out of the treasury of the county. In all civil actions and proceedings the defeated party shall be liable to refund the amount so disbursed; and after final judgment an execution may issue against him therefor in favor of the county commissioners, or, in the county of Suffolk, the city of Boston.

SECTION 4. In any case the court, upon its own motion or for cause shown, may order more than one, and not exceeding three persons, to be summoned as medical expert witnesses; and such additional witnesses shall be designated and summoned, and shall perform the same services and receive the same compensation as hereinbefore provided.

[SECTION 5. In any criminal proceeding the defendant may call and examine other medical expert witnesses in addition to those hereinbefore provided for, but at his own cost; and in such case other medical expert witnesses may be called and examined in behalf of the commonwealth.] [1]

SECTION 6. No medical expert witness shall be admitted to testify before any court or magistrate except as hereinbefore provided.

[1] Section 5 is inserted only to meet the possible objection of the unconstitutionality of the bill in its application to criminal cases.

REPORT OF A COMMITTEE ON THE USE OF THE METRIC SYSTEM IN FORENSIC MEDICINE.

PRESENTED AT THE ANNUAL MEETING, JUNE 10, 1879.

THE science of forensic medicine demands a comprehensive acquaintance with all the various departments of medical science; it requires, also, the exercise of habits of order, uniformity, carefulness, and accuracy in observation. While such observation renders necessary the constant use of the organs of sense and the consequent employment of reasoning processes, it is also true that other means are necessary to assist the senses in making and recording any observations that may be required. Such are the various instruments used in measuring distances, surfaces, quantities, weights, intensities of force, values, and time.

To find one accurate, uniform, and intelligible system which should combine in its various tables all necessary expressions of quantity was for a long time a desideratum, which was not attained until nearly the close of the last century. But not until the past ten years has the metric or decimal system made rapid progress among other nations beside that which gave it birth. So rapid, however, has that progress been that it now bids fair to become the accepted system of the civilized world. The United States Congress has legalized the metric system. So also have the legislatures of many States, including Massachusetts. Multitudes of scientific bodies and boards of education have expressed approval of it. The Massachusetts Medical Society, first to secure the abolition of that relic of semi-barbarous times, the coroner system, was also the first medical society in the land to give her support to the metric system, three years ago to-morrow, since which time more than forty medical organizations in the United States have followed her example.

Without further discussion of the details of the system, which have been sufficiently brought to your notice, both at the meetings of the State Society and in medical journals of the past five years or more, let us examine the reasons for its adoption by this society.

One would suppose, from the tenor of many articles published during the past few months, that the advantages of the metric system were limited to the trifling process of writing a prescription; but it has a broader and deeper significance, and especially so to the medical examiner. The duties of the members of this society are twofold: those which we owe to the State, consisting in the holding of views and autopsies upon dead bodies that come to our notice, with the proper report of such cases to the state or county author-

ities; also, those which we owe to this organization, and to the science of forensic medicine in general, including the annual and special returns required by our regulations. In the special returns made to the corresponding secretary, and also in the papers presented at our meetings, quantitative expressions must, from the nature of the subject, frequently occur, — expressions of value, of length, of surface, of weight, and of capacity. The size and weight of the body itself, whether it be that of a new-born infant or of an adult; the size and weight of the various organs of the body, the quantity of liquids in its various cavities; the size of wounds and bruises; the quantity of poisons found within or without the body; the size of weapons and missiles; the size of buildings and of their apartments; the surface distances of ground in the neighborhood of bodies found dead; the width and depth of streams, ponds, and other bodies of water; the distances at which voices can be heard; the distances at which people can be recognized by daylight and by moonlight; the size of hairs and of blood globules; the speed of railway trains, of falling bodies, and of missiles; the heat and cold of the weather as expressed by the thermometer, — all these and many other things which are properly of a medico-legal nature require constant expressions of quantity or of force.

Your committee believe it to be the duty of this society, therefore, in the first years of its organized existence, to adopt such terms for those expressions as are most *accurate*, most *uniform*, most *convenient*, and at the same time commensurate with the progress of medical science.

The superior *accuracy* of the metric system over all other systems, or so-called systems, cannot be doubted, since, setting aside its peculiar origin, it is certain that the standards *at present* adopted by the Congress of Nations have been constructed in the most careful and accurate manner, — far more so than any of the standards of ancient or modern times. The metric standards distributed to the various governments of some thirty civilized nations are models of accuracy.

As a matter of *convenience*, the meter, with its fractional part the centimeter, is a standard of convenient length for the measurement of the human body, and its parts or members — the cranium and thorax, and the same parts of new-born infants. The millimeter, with its microscopic fractions, becomes the best measure for the blood corpuscle, the liter for the determination of the fluids of the body, and the kilogram and gram for the weighing of the body or its component parts.

The metric system is one of international *uniformity*. There are a hundred or more measures bearing the name of the foot, no two of which are exactly alike. Many of the cities and provinces of Continental Europe had until lately independent foot measures, differing from those of their next-door neighbors. There is but one meter. There are a dozen or more measures called line, — the English line, the French line, the Rhenish line, etc. There is but one millimeter. There are quarts enough to confuse any arithmetician. There is but one liter. There are pounds of all sorts, pounds for buying and pounds for selling, long tons and short tons. Our own avoirdupois, Troy, and apothecaries' weight, are but a single instance of this. There is but one gram. Such a jargon of confusion as the old systems of different nations is worse

than Babel — without order, without uniformity, accuracy, or common sense. Can there be, then, a valid objection to casting them all aside, and beginning anew?

The advantages of a system of perfect uniformity cannot be overestimated. With the exception of Great Britain, the nations of Europe from which we derive the most information in forensic medicine, the best, the most accurate, the most searching investigations, are those which now use the metric system. English-speaking nations are slow to accept it, perhaps in consequence of a certain national tendency to resist foreign innovations. Hence we find in modern English works frequent errors arising from the attempt to transpose the metric system back into the clumsy English measures.[1] The use of the metric system with its uniform standard avoids such errors.

The science of forensic medicine in America is yet in its infancy. In order, then, to place ourselves in position, both as individuals and as a society, to comprehend the writings of our transatlantic brethren, and to make use of their experience, and in turn to contribute our own share to the general fund, let us strip ourselves of the old incumbrances which have so long hindered the progress of accurate and uniform investigation, — the so-called systems, which had their origin in the superstition, the ignorance, and the isolation of feudal times, — and adopt a system which is fast becoming universal, and whose tendency is constantly to bring enlightened men of every nation into greater harmony of thought and feeling.

A theoretical knowledge of the metric system may be obtained by a very few minutes' study of its simple tables, since these are nothing more than decimals under a new and significant nomenclature. But if a theoretical knowledge alone is acquired, it will soon be forgotten and neglected. In order to obtain a complete mastery of a foreign tongue, one needs not only to read and converse in it with ease, but also to be able to *think* in it. When the United States government, near the close of the last century, proposed a new coinage, entirely different from the British currency, one which was nothing more than the metric system applied to values, our forefathers did not content themselves with simply reading the newspapers, and then going back to the old pounds, shillings, and pence. They discarded the old coinage, and put the new dollars and cents in their pockets, making a daily practical use of them for all financial purposes. In order, likewise, to acquire a thorough knowledge of the metric system, in order to become familiar with it so as to think in it, it is only necessary to procure such metric weights and measures as may be requi-

[1] Woodman and Tidy's Forensic Medicine (American edition), on page 664, presents an example: near the bottom of the page we read 62 cm. = a trifle over 21 inches. This should read, correctly, 24.41 inches. And again, on page 687, where Casper is evidently quoted as to the length of the new-born infant, it is stated that the average new-born infant at maturity is $18\frac{4}{5}$ inches long; males, $19\frac{5}{6}$ inches long; females, $18\frac{5}{8}$ inches long. These are all transferred direct from the original text, and are Rhenish measures, but are not so stated by Woodman and Tidy. These figures correspond respectively to 19.35, 20.41, 19.17, English inches. The same is true on the following page, where Prussian pounds are given for the weight of the child, the reader being left to infer English pounds. An inch in the length or a pound in the weight of an average infant becomes a matter of considerable importance when race and climate are considered.

site, and make a constant use of them as occasion may require. A metric pocket-tape or a metric coin in the pocket is a constant and practical reminder of the system.[1]

Your committee recommend the passage of the following resolutions: —

(1.) That the Massachusetts Medico-Legal Society do hereby adopt the metric system, and order that it shall be henceforth used in the records of the society and in all papers published under its authority.

(2.) That the members of this society be requested to use the metric system in all their reports of cases and of autopsies whenever quantitative expressions may be necessary.

(3.) That we request all other medical organizations to unite with us in the work of transition from the old to the new system of weights and measures, in medicine and its collateral sciences.

S. W. Abbott,
F. Winsor,
H. P. Bowditch,
} *Committee.*

[1] For the usual purposes of the medical examiner, your committee recommend the following measures: —

One two-meter tape, of linen or steel.

One liter measure, of tin, copper, or glass.

One deciliter measure, of tin, copper, or glass.

Also one spring balance, capable of weighing from 10 grams to 10 kilograms.

These articles, together with all necessary information relating to them, may be obtained of the Metric Bureau at Boston.

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THE COLLECTION OF DATA AT AUTOPSIES.[1]

BY H. P. BOWDITCH, M. D.,
Associate Member.

THE records of autopsies, as ordinarily conducted for the purpose of ascertaining the cause or the seat of a fatal disease, contain as a rule little or no exact information in regard to the size of the different viscera, unless they vary from the normal standard sufficiently to attract attention.

The so-called normal standard of weight has been established for the most important viscera by the researches of Reid, Clendinning, Peacock, and others, but there is still a great lack of precision in our knowledge of the limits of normal variation of the various organs, and of the relation of the size of these organs to the height and weight of the individual.

Imperfect as is our knowledge of the size of the organs in an adult, our information in regard to the viscera of growing children is still more fragmentary. With the exception of the heart and perhaps of the liver, there is scarcely an organ whose rate of growth has been even approximately determined, and yet without this knowledge it is impossible fully to utilize the data obtained at the autopsies of children.

It is, moreover, possible that variations in the size of organs, even within what are usually considered normal limits, may so affect the relations of the different parts of the organism to each other as to produce tendencies and predispositions capable of exercising a profound influence upon the life of the individual. The well-known power possessed by the various organs of the body to adapt themselves to the demands made upon them (for example, the hypertrophy of one kidney after the destruction of its fellow) will of course tend to restore the equilibrium of the organism, but it is by no means proved that the power of adaptation is in all cases so perfect as completely to neutralize the effect of marked anatomical variations.

Led by considerations similar to those above presented, and with a view to determining how far the various diatheses recognized by authors can be explained by anatomical peculiarities of the organism, Professor Beneke, of Warburg, has recently published the results of an investigation into the absolute and relative size of various important organs at different periods of life and in connection with different morbid tendencies.[2] In researches of this kind

[1] Read at the October meeting, 1879.

[2] Die anatomischen Grundlagen der Constitutionsanomalien des Menschen, Marburg, 1878. Die Altersdisposition, Marburg, 1879. Ueber das Volumen des Herzens, Cassel, 1879. Ueber die Weite der Aorta thoracica und Aorta abdominalis, Cassel, 1879. Ueber die Weite der Iliacæ communes, Subclaviæ und Carotides communes, Cassel, 1879.

conclusions are valuable chiefly in proportion to the number of observations on which they are based, and the data at Professor Beneke's disposal were in many cases so scanty that, as he himself admits, further investigations are needed to confirm his conclusions. At the same time many of the facts which he has brought to light are so interesting and so suggestive that it seems desirable to call the attention of this society to the matter, in the hope that a discussion of the subject may lead to an organized effort on the part of the members to add to the data from which conclusions may be drawn in this most instructive field of study.

Some of the most important of Professor Beneke's results may be briefly stated as follows: —

(1.) Before the period of puberty the aorta is larger than the pulmonary artery; after this period the relation is reversed.

(2.) The aorta and pulmonary artery are smaller in the female than in the male, even at those ages at which the size of the body is greater in the female sex.

(3.) In adult males the volume of the lungs is greater than that of the liver. In adult females the reverse is the case.

(4.) In men the volume of the two kidneys is less than that of the heart; in women it is greater.

(5.) Children have a relatively larger intestinal canal than adults.

(6.) A sudden increase in the size of the heart occurs at the period of puberty.

(7.) The iliac arteries diminish in size during the first three months of life.

(8.) The cancerous diathesis is associated with a large and powerful heart, capacious arteries, but a relatively small pulmonary artery, small lungs, well-developed bones and muscles, and tolerably abundant adipose tissue.

(9.) Pulmonary tuberculosis is often associated with an unusually small heart.

(10.) In rachitis the heart is large and well developed.

Some of these results are in accordance with well-established physiological facts; others are somewhat unexpected. Before any discussion of Professor Beneke's conclusions can be profitably undertaken, it is important that they should be confirmed or modified by a more extended series of observations, and it is in collecting and recording data of this sort that the members of this society have it in their power to contribute very efficiently to the solution of an important class of scientific questions. The measurement of organs need not be very laborious. The size of arteries is determined by opening them on one side, flattening them out, and applying a millimetre scale transversely to their inner surface. The volume of organs is, according to Professor Beneke, a more important point to be determined than the weight, since in many pathological conditions (for example, fatty degeneration) it gives a truer measure of the change produced by the disease. The volume of an organ is readily ascertained by plunging it into a vessel completely filled with water, and measuring the water which overflows in a graduated glass. Where it is possible to do so it is desirable to ascertain both the weight and the volume of the various organs, for from these data the specific gravity may be calculated.

It is of course important to follow definite rules in regard to the separation of organs from the body, the selection of points for measurement, etc. These matters are very fully discussed by Professor Beneke in the above-mentioned essays, and future workers in this field cannot probably do better than adopt his carefully elaborated methods.

The direction in which the work of such a society as this can most profitably be exerted is probably that of securing as large a number as possible of observations on the size of the healthy organs at different ages. Cases of sudden death by violence or accident afford admirable opportunities for the collection of data of this sort, and if each member of the society were to make but one such carefully conducted autopsy in each year, there would soon be collected a body of statistics which would form an important contribution to our knowledge of the above-mentioned questions.

DEATH BY LIGHTNING.[1]

BY MEDICAL EXAMINER JOHN L. SULLIVAN, M. D.

THE following pages are, in the strictest sense, a compilation. The writer's acquaintance with the subject being imperfect and theoretical only, the production of an original paper was not attempted. In pursuing the task assigned to him by the society's president he has striven simply to collect and arrange in a convenient form for reference such matters relating to death by lightning as were thought to possess medico-legal value, and to be sustained by good authority. Although "marks of quotation" seldom appear, as a rule the language employed by the writers drawn upon has been retained *verbatim et literatim.*

In lightning shock what are the effects caused, and what, if any, are the distinguishing marks of death by lightning?

The effects caused by the passage of lightning or a fatal current of electricity through the animal body differ in different cases. The following examples of some of the so-called vagaries of lightning, taken from sources believed to be trustworthy, may be cited in illustration.

Lightning may heal as well as harm; it may abolish sight, hearing, and the power of voluntary motion, or it may restore the lost senses and cure paralysis. It may strip the body naked, and consume the clothing, while the wearer escapes unhurt, or it may consume the individual and leave his garments untouched; one person who is fatally struck may be hurled violently to a distance, while another is left in the precise attitude and spot in which death surprised him. One case shall present extensive anatomical changes, such as amputation of limbs, rupture of the heart, comminution of the bones, while in another case no injury whatever will be detected. One autopsy may reveal softening of osseous structures, collapse of the lungs, fluidity of the blood, and in another exactly opposite pathological conditions will obtain, to wit, engorgement of the lungs, coagulation of the blood, and rigidity of the muscular system. One thunder-stricken corpse shall undergo rapid putrefaction, while another shall remain for days unchanged, as if in defiance of the laws of decomposition. There may be sudden incineration of the body, or it may be consumed slowly as if by spontaneous combustion, and only gradually be reduced to ashes, or we shall not perceive the man dead until we touch him, and then see him fall to dust; one subject will present all the signs of death by freezing, another those of instantaneous petrifaction. Lastly, the immediate disappearance of the thunder-stricken person may occur, without leaving a

[1] Read at the February meeting, 1880.

trace of his body or any of its parts, thus summarily relieving the medical examiner of responsibility in the case.

It has been proved by experiments, the details of which would be out of place here, that these diversities in the phenomena of lightning shock are due to differences in the *quality* and *intensity* of the electrical discharges concerned in their production. The natural electrical discharges included under the general term lightning are not all one and the same thing; in short, there are several kinds of lightning, and each kind deals, so to speak, with the living organism in its own way. Sheet lightning, zigzag lightning, ball lightning are terms used in scientific as well as popular language to designate as many distinct orders of lightning. These differ from each other in several respects, notably in the appearance of the flash as perceived by the eye, in the quality of the shock or blow given, and in the effects produced.

Sheet and zigzag lightning have each a counterpart on a small scale in discharges obtained from a powerful induction coil. One of these discharges is made without, the other discharge with, the vibrating or mechanical break attached. The former is the analogue of sheet, and the latter discharge that of zigzag lightning.

Sheet lightning is either a simple flaming flash or a compound flash made up of two distinct flashes, a thin, tense flash combined with a flaming flash. The tense flash is destructive to life. The flame flash causes general muscular contraction, singes, scorches, perhaps blinds, or it may induce a state of insensibility or anæsthesia which may last a considerable time, but it does not necessarily destroy life. In lightning shocks we may see in the effects caused the evidence of one or the other of these discharges, or of both in one and the same subject. Thus, two persons standing together are simultaneously struck; one will be dead instantly, and his body will be singed and burnt, the other will be much shaken, scorched, and burnt, but will escape with his life. One will have received in his body the tense discharge combined with the flame flash, the other has been struck by the flame flash only.

Zigzag or forked lightning, like sheet lightning, causes muscular contraction, and with this difference, the contraction is persistent, or nearly so, and as the muscles concerned in respiration may be contracted without efficient relaxation, death may result from apnœa.

Ball lightning is described as an electrical or meteoric globe, which is sent from the cloud to the earth in a curved line like a bomb. Ball lightning is violently explosive, readily sets fire to the building on which it alights, and inflicts such injuries on the animal body as might be caused by the bursting of a shell. As far as I can learn, the phenomena of ball lightning have not been imitated in the laboratory. From the ordinary Leyden battery of jars and from the jars in cascade we obtain two forms of artificial lightning, characterized by intensity of shock, each of which has its counterpart in the grander phenomena of nature. The discharge from the ordinary Leyden battery acts like a mechanical blow. An animal struck by this discharge will be killed with convulsive movements, and left distorted, rigid in parts, or bruised. According to the intensity of the shock it produces two kinds of states: a state of insensibility, in which the body is prostrate and dead to all sense of pain,

but quite capable of recovery; and a state from which there is no recovery. A painless surgical operation may be performed on an animal while in the former state. The difference in the effect of shock admits of this explanation: when death does not follow the discharge, the shock has affected those nervous centres only which govern voluntary muscular motion and sustain nervous sensibility; when the shock kills, the effects extend to the centres which govern the involuntary muscular acts, first the respiratory, second the circulatory.

The discharge obtained from the jars in cascade presents to us the most fatal form of lightning shock. It is not flaming, not burning, as it falls on the animal body; it does not glide harmlessly over the surface of the body, as sheet and zigzag lightning are known to do; it penetrates and always kills, with little or no movement of the body and without disfiguration.

Death is sometimes caused by the phenomenon known as return shock (*choc-en-retour*), which occurs thus: During a lightning storm objects at a distance from the place of discharge may have been previously charged with electricity by the induction of the clouds; the distant discharge suddenly sets free this electricity so that it passes through the object to the ground. The bodies of persons killed by this form of lightning electricity may be left torn and mutilated, as if by gun-shot, or may exhibit no external mark of injury.

An analysis of all the cases recorded shows that there are various modes of death by lightning. It may kill (1) like any other shock, producing syncope, concussion of the brain, spinal cord, etc.

(2.) Like burns, by an intense and fierce heat, setting fire to the hair, skin, and clothing of bodies, and sometimes consuming the bodies themselves.

(3.) By explosion like gunpowder, or dynamite, showing ragged wounds and fractures of bones, effects like those of a mechanical blow.

(4.) By acting like a drill, or cutting instrument, it stabs and pierces the flesh, perforates and destroys the viscera.

(5.) By acting chemically on the blood, producing peculiar modifications of that fluid incompatible with life.

Many theories have been advanced to account for the cause of death from lightning shock, especially in cases in which there is an apparent absence of any structural lesion.

John Hunter's theory is that death is instantaneously produced in the muscles, "which, therefore, cannot be affected by any stimulus, nor consequently by the stimulus of death." Other authors have supposed that in all cases death is due to mechanical injury. A third class have attributed the fatal result to spasm of the heart and of the muscles of respiration. Dr. Richardson believes that the immediate cause of death is of a more simple nature, namely: that in all cases where death is instantaneous, it is due to the sudden expansion of the gaseous part, or atmosphere, of the blood, combined, in extreme degree of shock, with sudden conversion of animal fluid from the fluid to the gaseous condition. In support of this theory he adduces experiments which show that in proportion to the power of the shock there is expansion within the organism, expansion of the blood, distention of vessel, and, according to the degree and place of the expansion, the infliction of serious injury. Dr. Richardson's views are corroborated by many of the more frequent post-mortem appearances.

Under all forms of electrical discharge the best conductor in the animal body is the metallic chain of the blood, and the last organ to be brought into a condition of rest is the heart. When all other parts fail, the heart retains, and often for a long time, its action. At the same time the blood has no undue tendency to coagulate, and thus after the shock there are two conditions for recovery so favorable that the merest effort at respiration may lead to recovery. Hence it is, perhaps, that where death is not immediate, recovery is the rule.

The velocity of electricity along a copper wire exceeds that of light through the planetary space. It traverses the Atlantic cable at the rate of fifty miles per second. It is, therefore, quicker than thought, and the speed with which it traverses the animal body is undoubtedly greater than that with which sensation is transmitted to the conscious centres through the afferent nerves. As might be inferred, the reception of the shock which renders the body insensible seems to be unknown to the person injured. The concurrent testimony of those who have been thus struck down and who have given evidence on the event is that they were not conscious of what had happened until the commencement of recovery, the first symptom of recovery being restoration of consciousness. Death by lightning is probably, therefore, the most painless of deaths.

When a person is struck down by an electrical discharge and yet is not killed, the breathing power is reduced, the pulsation of the heart is reduced, the body is lowered in temperature, and there is often for some hours depression of muscular power. Tinnitus aurium, paralysis, insanity, delirium, fever, blindness, entire loss of memory, paralysis of the bladder, apoplectic insensibility, muscular twitchings and spasms, epileptiform convulsions, and other neuroses are some of the recorded results of non-fatal cases.

The fatality of the shock is in proportion to the intensity of the shock.

Those shocks which by their intensity kill most readily leave least of distortion or injury.

When we see a person who has been struck by lightning, we may in some instances know accurately from the injuries received the character of the shock to which he has been subjected.

In a very large number of cases there is sufficient evidence from the surroundings and from the appearance of the clothing and the body to warrant us in attributing death to the action of the electric current. Exceptionally, however, death by lightning may give rise to the suspicion of criminal violence. What will be the value of a medical examination in a doubtful case? If an individual has been struck dead by lightning, will it be possible to determine the cause of the death by an inspection of the body alone? What are the characteristic appearances, the thanatognomonic signs on which we may rely, when the identity and history of the subject are wholly undetermined?

The bodies of persons killed by lightning are usually distinguished by a variety of external appearances, ranging between an abrasion of the cuticle, a simple ecchymosis, erythema and scorching of the surface, on the one hand, and wounds resembling those of gun-shot or stabs from a blunt dagger, deep lacerations, fractures and dislocations, and the tearing away of more or less of the

body, on the other hand. The coincidence in the dead subject of a diversity of injuries, such as we have mentioned, will suggest the probability, or at least the possibility, of death by lightning, and the probability will be heightened if the individual's clothes are torn and burnt, and metallic substances about him are found melted. The conversion of metallic articles worn or carried about the person of the deceased, such as blades of pocket knives, keys, etc., into magnets by the action of lightning, is a phenomenon of not infrequent occurrence and of great diagnostic value.

Dr. Tidy observes that now that powerful galvanic batteries are becoming common in scientific institutions and private laboratories it is by no means unlikely that some deaths, accidental or otherwise, may happen from the sudden discharge passing through the human body. If called to such a case, he says, make a careful examination, sketch, and memorandum of the exact position of the body, as well as of the markings on it. Note also its proximity and relation to the battery, and the nature of the battery, with the arrangement of its wires, commutators, conductors, etc.

It must not be forgotten that the most fatal of shocks may kill and leave no external sign. A person will be left without a mark upon his body and yet he will be dead. And he may be left in such serenity of death, with such persistent brightness of eye, calmness of expression, and ease of limb, that you could almost accost him, as though he were in life, and deceive yourself that he did yet breathe. This wonderfully life-like appearance of the body is peculiar to death from the penetrating, intense form of lightning, which has its counterpart, on a small scale, as already stated, in the discharge from the Leyden cascade battery. The phenomenon is too striking to readily escape observation; when seen, it will at once arrest the attention and bespeak the fatal cause.

From the nature of their avocations an overwhelming majority of the deaths from lightning are in the male sex and happen out of doors. Suppose a person struck to have been sheltering himself under a tree or exposed openly. In the first case, if the man were standing, as often happens, with his head inclined slightly forwards, the lightning in passing from the tree strikes the body on the head and shoulders, causing a burn which is attended with much pain (if death or insensibility be not immediate), extravasation of blood, and congestion of the vessels over a broad part of the surface. From this a smaller stripe passes, running down to the nates, and gradually getting narrower and more superficial. On the buttocks, where in the man the clothes fit tighter, the conduction is more intense. The lightning (1) is either conducted by the skin thence to the trochanter, on one or both sides, the marks becoming fainter, and so on towards the knee, where owing to the tightness of the dress it causes a deeper burning, runs along the calf, and then, if boots are worn, passes over and destroys them; or (2) it passes along the skin to the heel, which it wounds, and after piercing the shoe makes a hole in the earth (often the lightning passes along the ankle), or the lightning may be conducted along the trousers, which it destroys or pierces with a round hole. In the second case, when the lightning strikes a person freely exposed on the ground, then usually the head covering is destroyed and the vertex smitten. From the ver-

tex the conduction may be twofold: either (1) from the cranial bones to the brain, producing death by the simple or combined influence of injury to the brain mass, or rupture of blood-vessels; or (2) along the skin. In the latter case the skin of the face and neck is almost always completely spared, and the lightning effects a considerable burn over the sternum. In some cases it enters the mouth and affects the teeth and tongue, causes loss of voice and bronchitis, or it may effect — and this may be the only lesion — the removal and disappearance of the tongue. Proceeding downwards the track passes towards the inguinal region; sometimes an interruption of conduction occurs, the lightning merely tearing the shirt. Occasionally we have deep burnings of the groins and genitals, occasionally mortal lacerations of the intestines; in milder cases congestion of the liver, spleen, stomach, etc. The conduction is then through the skin or clothing, or both, to the back of the foot, where a wound is produced. The burning of the hair is sometimes very remarkable, taking place without any injury to the skin. Hæmorrhage from the mouth and nose sometimes occurs.

Articles of clothing pierced or rent by lightning usually present peculiarities in the appearance of the holes or tears which it would be hardly possible to imitate artificially, and which are therefore of diagnostic value. No matter what the fabric may be, the holes or rents are quite homogeneous in appearance, and at first view suggest the action of fire. On closer inspection, however, they seem rather to have been produced by mechanical means, the edges of the tears or perforations being left smooth and free from ravelings, although not as cleancut as if made by scissors or punch. Carbonization of the edges of the tears, etc., has never been observed, but in the lighter fabrics browning of the edges for a hair's breadth is not infrequent.

Injuries of the human body caused by lightning naturally divide themselves into two groups: (1) external injuries; (2) internal, or visceral.

The external injuries that have been noted are: —

(1.) Burns.

(2.) Ecchymoses or spots.

(3.) Impressions of metallic substances and true metallic marks on the surface of the body.

(4.) Loss of hair.

(5.) Peculiar conditions of the eyes.

BURNS.

It is the opinion of some medical jurists that the electric current does not produce burns on the body unless some part of the clothes be ignited, and then of course the burning is an indirect result. This opinion is, however, disproved by well-authenticated cases where the dress of the individual has escaped combustion or ignition, while his body has been severely burnt.

The burns which have been observed differ in degree from mere singeings of the hair, superficial scorchings and blisterings of the skin, to extensive cauterizations leading to surrounding inflammatory action. Burns of the skin from the electric current sometimes assume a highly characteristic form, appearing as blue spots, in which the texture of the integument resembles leather

shrunk by the action of fire. Metallic substances in the dress, such as stay-hooks, pins, buckles, and the like, lead often to severe local injury. In these cases the parts which are burnt are those which lie between the metallic points, the seat of the burning corresponding with the break in the conducting medium. In a medico-legal point of view this is an important fact. It at once suggests the action of electricity or lightning, and where it occurs in a perfect way it may be regarded as diagnostic.

ECCHYMOSES.

Simple ecchymoses and livid spots, having no reference to metallic or other bodies in contact with the body, are sometimes presented on the surface of the body in a marked degree. The color of the spots is sometimes red, and drops of blood may issue from the pores of the injured part without wound of the skin. The spots appear most distinctly over bone, being, in fact, like to a a bruise produced by a mechanical blow. The passage of the electric current is not unfrequently marked by discolorations of the skin, often in the form of streaks, which are particularly to be traced in the direction of the spine.

IMPRESSIONS OF METALLIC SUBSTANCES.

Impressions of metallic substances on the surface of the bodies of persons struck by lightning have often been noticed. The validity of these observations was long denied by the masters in electrical science, but is now fully established. The impressions are of two kinds. In the first variety the nature of the mark is very simple. It is an ecchymosis taking the line of the metal, and so producing a rough outline taking the form of the metal. The shock must be received upon a firm surface, such as bone. Impressions of various ornaments, such as a bracelet, a chain, a cross, or of coins, may be most distinctly left upon the body. When these appearances present themselves with undeniable distinctness, we may unhesitatingly refer them to the action of an electric discharge. Something more than a bruise, however, may mark the passage of lightning along a metallic conductor. Fusion of the metal may take place, and the distribution of the particles in fine division may leave true metallic impressions on the surface of the body. Metallic marks precisely similar to those found on the bodies of persons struck by lightning have been produced upon the bodies of animals that have been experimentally subjected to the action of powerful electric discharges. In order to develop the metallic mark in distinction from ecchymosis or burn, it has been proved that two conditions must coexist. The metallic conductor must be sufficiently fine to offer resistance to the electrical current, and the electrical current itself must be an accumulative discharge of moderately low tension. The flaming discharge which so closely resembles sheet lightning will not produce the effect, although it will produce a burn. The tense discharge got from the jars in cascade will not produce the effect. The discharge required is that from the ordinary Leyden battery, and that of sufficient power in regard to the metal to cause fusion of the metal. A discharge of low intensity would produce heat of the metal and a burn, but it would not fuse even a very thin metal in such a manner as to leave a true metallic stain. A discharge of sufficient intensity

to fuse thin metal would fail to fuse thick metal. A discharge of great intensity would produce no metallic impression, and probably no mark at all; in other words, it would not be diverted from its course, but would penetrate the organism. We can determine in some measure from the character of the stain both the intensity of the discharge and the thickness and substance of the metal that has been fused. This is a very important piece of knowledge bearing upon medico-legal investigations. Thus, a person is found dead after a lightning storm; a doubt arises respecting the cause of death, or, if it be clear that lightning stroke is the cause, respecting identity of person. In such a case the detection of a metallic mark upon the body would be of the greatest moment. It would not only demonstrate the cause of the death, but the portion of skin containing the mark might be carefully dissected out and an idea might be obtained as to the metal that had left the stain. Moreover, by subjecting the part to chemical analysis the precise metal might be obtained. Armed with these two facts the medical witness could not only say that the mark he found on the body was a true metallic mark, but he could further say that the deceased at the time of being struck wore or carried a certain metallic substance of gold, silver, copper, or other metal.

Arborescent marks, naturally though wrongly supposed to be representations of the figures of trees fixed on the body, in miniature, by lightning, have been often noticed. This arborescence was correctly described and interpreted aright by Beccaria more than one hundred and twenty years ago. It may be fully accepted as a fact, and when it is found upon the body the evidence of lightning stroke is complete. The arborescence is not, however, the figure of a tree impressed on the surface of the body by the electrical discharge. It is an anatomical outline of the trunk and branches of superficial veins of the body of the subject, which the lightning, choosing the best conductor (namely, as before stated, the metallic chain of the blood), had followed out to its minutest ramifications, so that the figure of the veins appears through the veins penciled out finer than any pencil could have drawn it. The blood in these cases undergoes arrest of its motion, expansion, and possibly decomposition.

LOSS OF HAIR.

In some cases where the nervous centres have been particularly involved after lightning shock, and where paralysis has occurred, the life of the hair has been destroyed, and the individuals have become completely hairless and remained so.

AFFECTIONS OF THE EYES.

Two peculiar conditions have been noticed affecting the eyes of persons who have been killed by lightning. Sometimes they are found brilliant and protruding, so that the eyelids cannot be closed over them. Exactly in the two lateral segments of the albuginea thus left open, dark, bloody spots are observed, which may be considered as a sanguineous capillary infiltration, or electrical burning. These spots are of a conical form, much resembling an inverted pterigium. They occupy the sides of each eye, with their bases towards the iris, and their acute angles corresponding to the internal and external angles of each eye. This mark of death from lightning is usually, but not

invariably, accompanied with an injury of the epidermis resembling a burn. Some portions of the epidermis are found separated and rolled up and crisp, and sometimes wounds of an oval shape are noticed passing from right to left in an oblique direction and extending into the cellular tissue. These spots on the eyes are not imitable by human art, and may be considered, therefore, as thanatognomonic signs.

When the second condition referred to exists, the eyes present a uniform bluish cast, like a film over the pupil. This phenomenon is caused by a change in the structure of the cornea, which consists in a coagulation of the plasma taking place between the conjunctiva and the middle elastic coat. This change to opacity is instantaneously produced, and sometimes renders the cornea white and opaque throughout, like a bit of gristle, and remarkably thick. Beyond this injury there are usually no other changes; the aqueous humor, the crystalline lens, and the vitreous humor are left uninjured. Again, one pupil may be found closely contracted, while the other is widely dilated. In all these instances the shock has passed on the side of the head in which the pupil is contracted.

Before detailing the visceral lesions which distinguish death by lightning, let me caution the medical examiner against the hasty employment of the scalpel. The possibility of an ante-mortem autopsy must be borne in mind, and avoided. Simulated death from lightning is not an uncommon event, and it would be the easiest thing in the world to look upon a man struck by lightning as dead, when in truth he is not dead. He may be rendered insensible to pain, unconscious, and to common observation dead, and yet he may be capable of spontaneous recovery. Nay, he may exhibit several of the phenomena which are usually, and in most cases correctly, regarded as positive signs of death, and he may, notwithstanding, recover. Thus, in a case of apparent death from lightning, it would be wrong to decide too hastily that life is extinct merely because there is absence of any indication of motion of the heart. The pulse at the wrist may be imperceptible, we may fail to detect any impulse or sound of the heart, or any arterial pulsation whatever, and yet, on opening the thorax, the heart might be found still beating, feebly, it is true, but not so feebly but that the normal action might have been re-established, and recovery have taken place. As a rule persons who have been simply stunned by an electrical or lightning shock show signs of reflex motion, so-called, when an irritant is applied to the eye, or when the skin is pricked over a muscle. The absence of any exhibition of reflex action is usually certain evidence that living action is suspended, yet this rule must not be taken as invariable. Again, absence of color in semi-transparent structures, as, for example, the hand, when tested by the passing a strong light through them, and observing if the red color which is seen in the living parts is absent, ordinarily a good sign of death, and the decrease of the temperature in the cavities to the temperature of water exposed to the surrounding air, a fair proof of death in warm-blooded animals, must not be accepted as absolutely reliable in the case of persons who have been left apparently dead after lightning shock.

The positive signs of death are three: (1) rigidity of the muscles; (2) coagulation of the blood; (3) decomposition of the tissues.

RIGIDITY OF THE MUSCLES.

If muscular rigidity be general, and the muscles of the chest be rigid, the evidence of absolute death is sufficient. But a partial or local rigidity of muscle, as of one limb, is not sufficient evidence.

COAGULATION OF THE BLOOD.

This is a ready and good sign of death. In the human subject the largest vein that can be found immediately upon the skin should be laid freely open, a fillet being first applied above the place for the opening. If, then, in the vein there be found a coagulum, the inference is fair that the process of coagulation is complete, and that the restoration of life is impossible.

DECOMPOSITION OF THE TISSUES.

The occurrence of decomposition of the body is the final proof of absolute death. In the absence of distinct coagulation of the blood in the venous system, and of general rigor mortis, evidence of decomposition ought always to precede dissection or the act of burial.

In a forensic point of view it is important to remember that the statement of John Hunter, so long accepted as authoritative, namely, that "animals killed by lightning and also by electricity have not their muscles contracted," is a fallacy. Rigidity of the muscles after death from this cause is an invariable fact under all conditions that admit of the process of rigidity. The rigidity is well marked, often intense and prolonged. The persistence of the rigidity is in proportion to the intensity of the rigidity itself (from forty-eight to ninety-six hours). The conditions favorable to the development of rigor mortis are good development of muscle, death without great preceding exhaustion, and exposure to a warm temperature. In the absence of these conditions the rigidity would be delayed and reduced in character, but it is doubtful if even then it would be wholly wanting.

For instance, if a man or animal after being struck were to be exposed to cold, and especially to a current of cold air, or if an animal were very thin and cooled quickly, the delay mentioned would take place, but the delay would bear no kind of relationship to the lightning shock as the mode of death. Bearing these facts in mind, we can easily reconcile the conflicting statements on record concerning thunder-stricken subjects, to wit, the entire absence of rigidity on the one hand, and such phenomenal development of rigor mortis on the other hand as to deserve the epithet stony or statue-like.

However the fact may be explained, — and it awaits explanation, — coagulation of the blood *within the body* after death is delayed by lightning shock. There is coagulation, but it takes place slowly within the vessels; on being set at liberty, however, it undergoes the natural process of coagulation. In every case of death by lightning discharge, and by whatever form of discharge, the blood is changed in color, and in so far as color is concerned arterial is changed into venous blood. If the blood thus changed is exposed freely to oxygen the normal color is restored. In that extreme condition of complete disorganization which is sometimes observed after lightning shock the blood is left fluid and incoagulable, the body is distended with gas, and the destruction of

organic parts is well-nigh universal. The blood in such cases is decomposed throughout the body, precisely as it is decomposed in the laboratory when the Leyden shock is sent through closed tubes charged with blood. The color of the blood is changed to a deep black, the gases of decomposition are instantly set free, while in a greater or less degree the same change extends to the soft solids. In a word, there is general decomposition. In any case in which the body of a person who but a short time before was known to be alive is found dead and in the condition described, we need be at no loss to refer the death to its true cause.

Beginning with the brain and passing downwards through the different organs, let us now describe the changes which have been found in the viscera when death by lightning has been unaccompanied with instantaneous disorganization and decomposition.

Brain. The vessels of the brain and its appendages are found distended. The sinuses are enormously distended, more so than the quantity of blood which they hold would seem to account for. The arteries, on the contrary, are contracted and nearly empty. Occasionally a small effusion or a film of blood, showing rupture of a vessel, may be found beneath the arachnoid. In some instances the brain itself (as far as mere observation with the naked eye is of value) apparently escapes injury. Its structure is of natural pink hue, and congestion of the minute vessels and vascular points are absent altogether. The same observation extends to the medulla and the spinal cord. The cord itself is healthy, and there is no turgescence of the vessels. In other instances, particularly when death has been delayed for several days, extensive effusion and coagula resembling those of sanguineous apoplexy have been discovered. Often on lifting up the brain and the medulla there is a free escape of bubbles of gas.

The membranes show great redness and vascularity in parts, whenever the fatal discharge has coursed from the head to the lower extremities.

The Lungs. The lungs are usually found natural, left filled with air, of a pink color and free from any trace of congestion. On the pleural surface small ecchymoses are sometimes found, indicating the course the electric current has taken. It is not usual to find signs of injection, redness, or effusion.

The Heart. The heart in all cases is gorged with blood on the right side, and not unfrequently the left side contains a large quantity of blood. The blood is darker than usual in the venous, and very dark in the arterial chambers. There may be rupture of the muscular wall of one or more of the cardiac chambers with exudation of blood; such rupture of the heart is not uncommon. Ecchymosed spots are sometimes found on the surface of the pericardium, and excess of fluid in the pericardial sac.

Alimentary Canal. The alimentary tract is an excellent conductor of the electric current, and important changes are found in it in most cases of death by lightning, and some changes in all. Occasionally the walls of the stomach are ruptured, or they may be found softened as if in the early stage of gangrene. The intestines throughout the whole tract of the small intestines are sometimes intensely injected through their structure and of a dark purple color. In one case, in which the individual survived the shock for a few days,

the stomach, after death, was seen to be gangrenous within, over a large extent, while the external surface was inflamed and livid. The inflammation was not that of great action. The gangrene, commencing near the cardia, extended over the whole of the stomach to within two inches of the pylorus. A portion of the meso-colon of the size of a half crown was of a bright red color, and of a very fine, delicate membranous texture. In a forensic point of view the knowledge of these effects of lightning shock on the alimentary system might be very important. In a doubtful case of death after lightning shock, these appearances might be mistaken — and that readily — for the effects of an irritant poison.

Liver. Rupture of the structure of the liver and of the gall-bladder are lesions that occasionally present themselves. Usually, however, the gall-bladder is greatly distended, and the liver itself colored deep red, although of normal consistence.

Spleen. The spleen may be found natural in structure and appearance, or it may be ruptured, or left in a state of softening and discoloration; usually, however, the changes observed in this organ are not very important.

Peritoneum. In some cases the surface of the peritoneum presents a line of deep, dark, ecchymosed spots. These spots are well defined, dark as jet black inkstains, often arranged in a line mapping out the course which the electric current had pursued in its passage through the body.

Kidneys. The kidneys are always found congested, but not subject to any other lesion, the congestion itself being connected with the congestion of the larger blood-vessels and of the left side of the heart. It would appear to be a secondary result.

Such are the gross appearances, so far at least as I have been able to ascertain, which in a doubtful case of death by lightning may be regarded as of diagnostic value. I regret that in exploring the literature of the subject I have failed to meet with any record of microscopical examinations of the nerve-cells and other tissues.

WHAT CONSTITUTES THE "DEAD BODY OF A PERSON"?[1]

BY MEDICAL EXAMINER A. F. HOLT, M. D.

SOME time last summer there floated ashore, a few miles down the coast, a human leg. The attention of one of the medical examiners for the county in which this occurred was called to it, and he viewed it. The question at once arose, Could this leg be considered the dead body of a person? Out of this grew the question, What does the term "dead body of a person," as it occurs in the new law, mean?

When this question was first put to me, I was inclined to answer much as I heard a physician in court, a few days ago. This physician, being asked, What is spinal irritation? replied sharply and promptly, "Irritation of the spine, sir." So I was inclined to say that the dead body of a person was the body of a person that had ceased to live. This definition would no doubt cover its common meaning. The law seems to give it a somewhat wider one. What that meaning may be, I have tried to determine in this paper.

The question seems to be a rather novel one. Of the many medico-legal works I have consulted, only one mentions the subject. Casper, in his great work on legal medicine, asks the question, What is a dead body? in especial relation to the Prussian law regulating burials; and gives a single page to its discussion.

The first question relating to this subject, as I have put it, — that of mutilated remains, — notwithstanding it is a discretionary one, does not seem to me to admit of much discussion. The second — that relating to fœtuses in the early stages of development — is, as I view it, a technical one, and answered by the law. The questions this matter raises are more legal than medical. In deciding such I have relied on members of the legal profession.

The statute of 1877, chapter 200, section 8, abolishing the office of coroner, and creating that of medical examiner, provides that "whenever a medical examiner has notice that there has been found, or is lying within his county, the dead body of a person that is supposed to have come to its death by violence, he shall forthwith repair to the place where such body lies, and take charge of the same." Other parts of this and the succeeding sections of this act give clear and definite directions as to what his duties shall be in all cases that are likely to arise in the discharge of such official duties. But the law does not designate, nor anywhere indicate, what he shall consider to constitute the dead body of a person. This omission, whether intentional or otherwise,

[1] Read at the February meeting, 1880.

leaves the matter wholly to the determination of the medical examiner. This being so, the first question that will present itself in all cases where he is called officially will be, Is this "the dead body of a person," within the meaning of the law? If he determines that it is such a body, then he can proceed to make such examination as the case may seem to him to require. But if he decides that it is not such a body, then, as the law under which he is acting specifies only that it is with dead bodies he shall have to do, his official connection with it, at least, ceases.

In a large majority of cases this question will present no difficulties. The body will be mature; it will be whole, or nearly so; and its general appearance and condition will be such that the examiner can determine at once and certainly that it is the dead body of a person. The only conditions under which this question may become difficult, or give rise to any difference of opinion, are perhaps two: first, where mutilated remains or fragments of a body are brought to the notice of the examiner; second, where he is called to view the body of a fœtus in the early stage of its development.

There is possibly one other condition of the body where the question, Is this a dead body? may present itself, and that is, where death is simulated in such a way as to make it difficult to determine whether the body is dead or quick. Popular opinion would have us believe that this is a very common occurrence. The story of the burial of a live person is one of the horrors that occasionally goes the round of the public press. After looking up this matter, I am well satisfied that cases of simulated death that would deceive the expert are the rarest of occurrences, even if they occur at all. Ogston, in his Lectures on Medical Jurisprudence, says: "It must be admitted that most if not all of the cases that have hitherto been selected as illustrative of the reality of such occurrences, are not such as will endure any close scrutiny."[1] When we consider the vast number of deaths that have been observed, and the small number of cases where any difficulty has been found in determining whether death was present or not, we must conclude that such a case is little likely to come to us in our official capacity. If such a case should occur, the medical examiner has at his command a sure and certain means of deciding it. The law says he shall take charge of the body. It would only be necessary to retain it under observation, and in any such temperature as humanity would dictate that it should be kept if there was a suspicion that life was present, it must soon show signs that would be unmistakable, if it were really dead.

To come then to the first question. Are all mutilated remains found under suspicion of violence, and brought to the notice of the medical examiner, to be considered as the dead body of a person? The medical examiner, being a creature of statute law, must in the performance of his official functions be governed by the law that has created him and defined his duties. But in this case, as there is no specific rule for his guidance, it is evident he has some discretionary power in the matter, and it is expected that he will follow the dictates of reason. If, for example, he is called upon to view a human head, severed from the body, and a careful examination fails to reveal the whereabouts of the remainder of the body, it would clearly be his duty to take

[1] Lectures on Medical Jurisprudence, page 361.

action in such a case. He has positive evidence in his possession of the death of a person, and this head alone may furnish the most conclusive proof that the death was the result of criminal violence. It may be all that remains of the dead body of such person, and a proper examination of it will accomplish the object of the law. The same may be said of any other vital part.

What is to be the action of the medical examiner when small parts of a body are brought to his notice, such parts, perhaps, as might not necessarily destroy life in their removal from the body? This question, being a part of the one just discussed, is like it, of course, a discretionary one, and to be answered according to the purposes of the law. The great object of a medico-legal examination is to assist in the detection of crime, and the medical man is selected by the law as the most competent person to determine what evidence the dead body presents of a crime having been committed. His duties are by a careful and painstaking examination to determine, as well as may be, the cause of death, and thereby whether crime has been committed or not. If there has been, it is his duty to carefully preserve such evidence of the crime as the body may furnish. He is also to note all marks or peculiarities that may assist in identification. There can be no doubt that the law intended he should do this in all cases, no matter whether the body is whole, or badly mutilated, or whether only fragments of it can be found. If it can furnish evidence that may be of service in the detection of crime, it is clearly his duty to take cognizance of it.

This being the duty and object of his office, the practical question would seem to be, Can such small parts of human remains furnish such evidence as shall lead, or assist in leading, to the detection of a crime committed on the body of which such remains were a part; or may they be of assistance in leading to identification? It appears from the following cases that very small parts of a body may furnish evidence of a positive character. Ogston, in his Lectures on Medical Jurisprudence, relates the following:[1] On one of the London bridges were found in a basket parts of a human body, which the utmost activity of the police failed to identify, while no clew was obtained to the party or parties who exposed them, the greatest care having been taken to destroy all traces of their identity. But here, though the head was wanting, as well as the greater part of the spine, the hands and feet, portions of the left side of the chest, and the whole of the viscera of the chest, abdomen, and pelvis, and most of the muscles, Dr. Taylor clearly made out the sex, from the bones and a portion of the corpus cavernosum of one side left attached to the ischium; as also the probable age of the person, his height, the color of his skin and hair (these last from fragments of skin left on the wrist and one knee), and the date of his death approximatively. He also showed that the mutilation must have taken place while cadaveric rigidity continued in the body, that is, from eighteen to twenty-four hours after death; that the individual had received a wound in the left side of the chest, over the seat of the heart, while alive or only recently dead; that after death the limbs had been in the distorted state usual in cases of violent death; and that the muscles had been exposed to boiling water, and afterwards salted.

[1] Page 71.

In another case the trunk of a woman was discovered in a sack, the head and legs being missing. The person who examined this mutilated body could find nothing to serve for identification but a malformation of the uterus, the mark of a ring on one finger, and the horny cuticle of one who had been engaged in household work. The bloodless state of the body, however, pointed to the mutilation having been effected before the corpse had cooled. The head when afterwards found at a different place, exhibited the profile peculiar to the low order of Irish. The lower extremities, when discovered at a still later period, exhibited as a sole peculiarity a dyeing of the skin, as from the wearing of black stockings. The sections of the bones of the thighs and neck, when now compared, were found to exactly correspond. This examination assisted the detection of the murderer, when subsequently arrested on suspicion.

In the famous case, with which most of us are familiar, of the Commonwealth *v.* Webster, for the murder of Dr. Parkman, the remains were found in a badly mutilated condition. In the vault of the privy connected with Professor Webster's laboratory at the medical college in Boston, were found a pelvis; the right thigh from the hip to the knee; the left leg from the knee to the ankle; and with them were found certain towels with the initials of the prisoner, and similar to those used by him in his laboratory. On the same and following day were also found in the furnace of the laboratory, fused in with the slag and cinders, a great number of bones, and certain blocks of mineral teeth, and certain quantities of gold which had melted. There was also found in one corner of the laboratory a tea chest containing, imbedded in a quantity of tan, a thorax, or entire trunk of a human body, the left thigh, from the hip to the knee. There were missing from this human body, when placed in apposition, the head, arms, hands, both feet, and the right leg from the knee to the ankle. As is well known, Professor Jeffries Wyman and other scientists, after a careful and painstaking examination of these remains, determined that these were parts of the body of Dr. Parkman. The strong points in the identification were perhaps some peculiarities in the general form, the muscular development of the legs, an unusual quantity of hair upon the back, and the blocks of teeth, which, curiously enough, were not a part of the body proper.

Many other cases could be cited, where the identification was made out from only small fragments of bodies. A leg or arm may answer some very important questions of this kind. For example: What is its general character? Is it that of a child or an adult? Did it belong to the body of a male or female? What is the color of the skin? If an arm, is the hand soft and white, or is the skin tanned and horny? Is the arm fat or lean? What is its muscular development? Are certain muscles developed more than others? What is the appearance of the end that was attached to the body? Is it a smooth cut, or is it rough and ragged? Are there any wounds on the limb, and if so, what are their appearance? Were they made before or after death?

These, and many other questions, that the condition of the limb might suggest, would be answered by a proper examination. Matters that might be of the greatest importance in proving identity, and in sustaining a criminal action, would be settled.

It is in just these cases of extreme mutilation, that the law has made its greatest demands on medical science; and it is in the investigation of some of these, that our science has won some of its greatest triumphs.

It seems to me from these considerations that it is clearly the duty of the medical examiner to take action in any and all cases of mutilated remains, where there is a suspicion of violence, no matter how fragmentary they may be. Any other conclusion must make the law a failure in many cases that may arise. It may be urged, in opposition to such a conclusion, that the medical examiner should act in accordance with the letter of the law, and if such a course did not accomplish its object in all cases to hold the law itself responsible. But the application of all laws is left partly to the dictates of reason, for only in this way can they be made applicable to all cases where it was intended they should apply. In the matter under consideration, for example, it would not probably be practicable to specify what parts of a human body should be held to constitute the dead body of a person and what not, in such a way as to cover all cases that might arise. And so there is no doubt of the wisdom of the law in leaving it, as it does, to the reasonable discretion of the medical examiner, and making him responsible for its proper interpretation.

The only other objection that can be made to considering all remains the dead body of a person for the purposes of the law is that of expense, an objection that can have no weight where such an important consideration is concerned as the protection of society.

Is the dead body of a fœtus before it is viable the dead body of a person within the meaning of the law? In answering this question in its usual meaning, it must be said there can be no doubt that a fœtus at any stage of its existence is a human being, and if dead it is a dead human being. The law fully recognizes this in respecting its rights at every period of gestation; for it appears by the legal authorities that it may at any stage be appointed executor, may take as a legatee or under a marriage settlement, or may obtain an injunction to stay waste.

Notwithstanding the law so fully admits a fœtus to be a person in every stage of its existence, for certain wise and practical purposes it contradicts this. Bouvier, in his Law Dictionary, says:[1] "A dead-born child is to be considered as if it had never been conceived or born; in other words, it is presumed it never had life, it being a maxim of the common law that *mortuus exitus non est exitus.* This is also the doctrine of the civil law: not to be born and to be born dead are equivalent." Russell on Crimes says:[2] "Questions of considerable nicety sometimes arise on trials for infanticide as to whether the death took place after the child was actually born or whilst it was in the process of being born, and although the law be clear that a child must be actually born to be the subject of murder, perhaps it is not clearly settled what constitutes actual birth for this purpose. Where, on an indictment alleging that the prisoner was delivered of a child, and that she afterwards strangled it, it appeared that the child had breathed, but the medical men could not say whether during the birth or afterwards, Littledale, J., told the jury the being

[1] Page 432.
[2] Russell on Crimes, page 485.

born must mean that the whole body is brought into the world, and it is not sufficient that the child respires in the progress of the birth."

So of an indictment containing a count for murder by stabbing before the child was completely born, and a statement that it was born and then died of the stab, Parke, J., said: "The child might breathe before it was born, but its having breathed is not sufficiently life to make the killing of the child murder; there must have been an independent circulation in the child, or the child cannot be considered as alive for this purpose."

Where the prisoner was indicted for the murder of a child by cutting off its head, and a surgeon stated that the child had breathed, Coltman, J., said: "In order to justify a conviction for murder you must be satisfied that the entire child was born in a living state. The fact of its having breathed is not a decisive proof that it was born alive; it may have breathed, and yet died before birth. But if a child be actually wholly produced alive it is not necessary that it should have breathed to make it the subject of murder."

Casper, in relation to the Prussian law regulating burials, says:[1] "The royal ober-tribunal has in one case pronounced the following judgment: The meaning of the expression 'dead body' can only be determined with relation to the practical purposes of the law and the ordinary acceptation of the term, and therefore the viability of the child must in every case be ascertained before the term 'dead body' can be applied to it. And in a second case it has decided that a fœtus born at the fourth or fifth month, and proved to be unviable, cannot be regarded either according to ecclesiastical usage or civil law as a dead body to which the directions and regulations respecting burial are applicable."

Greenleaf, the eminent American author on the law of evidence, says[2] that "to support an indictment for infanticide it must be clearly proved that the child was wholly born, and born alive, having an independent circulation[3] and existence. Its having breathed is not enough to make the killing amount to murder, as it might have breathed before it was entirely born. Nor is it essential that it should have breathed at the time it was killed, as many children are born alive and do not breathe for some time afterward." It also appears, from the decisions of the courts of the Commonwealth, that "if a child is born dead it cannot be regarded as having been the subject of violence, even though it were destroyed by human agency, no matter at what age."

[1] Forensic Medicine, vol. i. p. 4.

[2] Greenleaf on Evidence, eighth edition, vol. iii. sect. 161.

[3] It does not seem to be clear just what is meant here by the term "having an independent circulation." If a fœtus is born alive and does not breathe, and the attachments of the placenta are not disturbed, its relation to the mother, as far as the circulation is concerned, is the same as it was before birth, and it may live in this way for some time. It has an independent circulation, as it has had for some months in the uterus, and nothing more; for the blood does not seek new channels until the child has breathed, or soon after. It occasionally occurs, however, that there is a short time between the cessation of pulsation in the cord and the commencement of breathing, when its fœtal circulation is all it has, but this cannot support life for any length of time, and I hardly think the expression refers to this. The more probable explanation is that this term has been handed down from a time when there was no definite knowledge as to just what takes place when the fœtus assumes an independent existence. As the only positive evidence that the child has lived separate from the mother that can be obtained from the body is that brought about by the breathing, the whole matter practically turns upon the point whether it has breathed or not.

It would clearly seem from this that the law, evidently for the purpose of limiting the time at which a murder can be committed to a period after birth, does not recognize a fœtus which has not sustained an existence of its own as a person, nor when dead as the dead body of a person. Neither can it be the subject of violence, and with such a class of beings the medical examiner has nothing to do. The very object of his office is to determine what evidence of violence the body presents, and a body that is not capable of receiving violence can in no way be the object of his official examination.

In a case of criminal abortion, even if the fœtus, from some injury, furnishes strong proof of the crime, he can have no connection with it as medical examiner. The authorities may summon him to determine what evidence the fœtus presents of the crime of abortion having been committed, but not in his official capacity. If a woman dies as the result of a criminal abortion, then he can take notice of the fœtus as evidence pointing to violence done on her body, the same as he would of the placenta or condition of the uterus, but in no other way.

He must, however, be able to determine whether a fœtus brought to his official notice belongs to this class or not, and if its size and general development is such that he cannot decide at once whether it has lived or not, it is clearly his duty to consider it the dead body of a person until proved to be otherwise. This makes it of practical importance to determine at what period of life a fœtus may support an independent existence. Some of the older authors say that cases have occurred where the child has lived, though born as early as the fifth month, but such cases are not well authenticated. The better opinion now seems to be that a child cannot live if born before the sixth month, and to enable it to sustain continued life it must have arrived at a still later period of gestation. As the law only requires that it shall support life for an instant to make it a person, it is only possible to fix the time at which this may occur approximately. As the medical examiner would surely neglect his duty if he should fail to make an examination in the case of a fœtus brought to his notice that had come to its death by violence, it would perhaps be safest to conclude that all fœtuses born in the first half of pregnancy cannot live for any period, and the body of such an one cannot be considered the dead body of a person within the meaning of the law.

In conclusion, then, from the above considerations it seems to me that the term "dead body of a person," as it occurs in the examiner law, may mean any part or parts of a human body that is supposed to have come to its death by violence.

THE MEDICO-LEGAL RELATIONS OF ALCOHOLISM: ITS PATHOLOGICAL ASPECTS.[1]

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I. ACUTE ALCOHOLIC POISONING.

THE pathological anatomist meets with two classes of cases of alcohol poisoning, the acute and the chronic. The former is not unfrequently the immediate cause of death, the latter rarely so. That fatal cases from acute poisoning are not so rare as might be supposed is shown by the fact mentioned by Taylor, that in four years (1863–1867) thirty-five deaths from this source occurred in England and Wales alone.[2]

In describing the post-mortem appearances it will be necessary to describe those belonging to the two classes separately. The statements of different observers vary greatly in regard to these appearances, and in many respects are entirely contradictory. This is due, no doubt, to the want of making a proper distinction between the acute and the chronic forms, many symptoms thus being considered as due to acute poisoning which are in reality met with in chronic cases only.

Within a short time the effects of the different kinds of alcohol in poisonous doses upon dogs has been thoroughly investigated by Dujardin-Beaumetz and Audigé. These investigations were carried on by means of more than two hundred and fifty experiments upon as many different animals, and the general conclusions drawn from them were as follows:—

"In animals which succumb to acute alcoholic poisoning anatomical lesions are constantly found, which vary in intensity with the strength of the alcohol. These lesions occur especially in (1) the digestive organs; (2) the circulatory and respiratory organs; (3) the nervous system; and (4) the kidneys.

"(1.) *Lesions of the Digestive Organs.*—In regard to the stomach the changes are less marked when the alcohol has been administered subcutaneously, and then only a slight redness towards the pyloric extremity is perceptible. But when the alcohol is administered by the œsophagus the lesion is more marked, and, in certain cases, the mucous membrane is more or less softened; the effects depend on the strength of the alcohol, being much more marked when the alcohol is concentrated, and therefore more caustic.

"The alteration in the small intestine is more constant and more marked when the alcohol has been administered hypodermically; it exists more espe-

[1] Read at the annual meeting, June 8, 1880.
[2] H. C. Wood, Therapeutics, Materia Medica, and Toxicology.

cially in the upper part of the intestine, but when death is protracted it occurs throughout its whole length. The intestinal mucous membrane is then softened, its surface of a dark-red color, and it presents, in the majority of cases, more or less abundant hæmorrhages. These appearances may be accounted for by the elimination of the alcohol by the intestinal glands.

"In the large intestine a hæmorrhagic appearance is met with, especially towards its inferior extremity and on the longitudinal bands.

"The liver is the gland most seriously affected in acute alcoholic poisoning; this organ, always very quickly congested, is soft throughout and friable; it can be torn between the fingers, and the hepatic cells may be destroyed in a great measure. The spleen is also engorged with blood and its tissue softened. Finally, in a certain number of cases, the head of the pancreas is found to share in the congestion presented by the duodenum.

"(2.) *Lesions of the Circulatory and Respiratory Organs.* — In acute alcoholic poisoning, the blood is essentially altered; it is blackish and forms more or less abundant clots in the heart. The pulmonary lesions are characterized by a distention of the vascular system. This congestion is frequently more marked when the alcohol has been introduced by the stomach, and in these cases there are ecchymoses at the base of the lungs.

"(3.) *Lesions of the Nervous System.* — Lesions of the cerebro-spinal axis are characterized by considerable venous congestion of the meninges. In the brain, the veins and the sinuses are engorged with blood and the gray matter is also somewhat congested. These cerebral lesions are more pronounced the longer the comatose period continues.

"(4.) *Lesions of the Kidneys.* — These lesions are but slightly marked when caused by fermented alcohol, but when due to œnanthylic and caprylic alcohol are more pronounced. But it is above all in acute glycerine poisoning that they attain their greatest intensity; there exists then not only a congestion of the organs, but a certain quantity of blood is found in the bladder."

Lallemand, Perrin, and Duroy (Alcohol et des Anesthésiques) state that "marked anatomical changes are found in animals which have died from the administration of alcohol. The mucous membrane of the stomach and of the upper part of the small intestine is inflamed, sometimes quite violently. The liver is much congested. The lungs show no signs of asphyxia or even real congestion. The right side of the heart and the large veins are filled with very liquid, dark blood. The meninges are engorged with blood. The alcohol is diffused through all the tissues and secretions, but the brain, cord and liver contain a much larger proportion than any of the other tissues."

So much for poisoning in the lower animals.

ALCOHOL POISONING IN MAN.

On inspection, the dependent portions of the body are found discolored by hypostatic congestion. It has been claimed by some that decomposition sets in very slowly, but this is denied by others.

"The general appearances resemble more or less closely those of asphyxia; the right side of the heart, the pulmonary arteries, and the systemic veins being loaded with blood, while the left cavities and the arterial system are com-

paratively empty, the blood which they do contain being dark.[1] The sinuses and the whole venous system of the brain are turgid with dark blood." [2]

The blood is very fluid or imperfectly coagulated and of a dark color.[3]

The mucous membrane of the stomach is usually found very much injected, as indicated by either a bright [4] or deep red [5] color, covered with coagulated mucus (albumen),[6] and sometimes ecchymosed.[7] The congestion usually extends both into the œsophagus and into the small intestine.[8]

The action of strong alcoholic liquid on the mucous membrane of the stomach so closely resembles the effects produced by arsenic and other irritants as easily to give rise to the suspicion of mineral irritant poisoning.[9]

The amount of alteration in the gastric mucous membrane will vary, of course, with the quantity of alcohol taken, its degree of concentration, and the amount of food, etc., in the stomach.

A very few cases have been reported in which the mucous coat has been found in a sloughing condition. According to Baer frequently no lesions are perceptible. In such cases the fluid has been taken very much diluted.

Alcohol is found to be present in the contents of the stomach in variable quantity or entirely absent [10] from the same, according to the quantity ingested, the rapidity of absorption, and the time which has elapsed between the last potations and the death of the individual.

The length of time that portions of it may remain in the stomach is consequently very uncertain. Taylor mentions a case in which a pint of spirits was taken and a fatal effect produced in eight hours, but no traces of it could be detected in the stomach. That it may entirely disappear from the stomach long before it is eliminated from the other organs is proven by a number of cases of more or less chronic poisoning related by Magnan. In one of these three days and six hours had been passed without excess in drink; the liver and brain contained alcohol, but none was found in the blood or other organs. In another patient who had died fifty hours after his last potation, alcohol was found in the liver, brain, and blood in very appreciable quantity; the lung also contained traces.

When present, as it probably almost always is,[11] at the time of death in cases of acute poisoning, the contents of the stomach will of course possess the odor of the liquor ingested, unless masked by some other substance present.

The mucous membrane of the respiratory tract exhibits a widely spread and

1 Carpenter on Alcohol.

2 Woodman and Tidy, Forensic Medicine and Toxicology; Carpenter on Alcohol.

3 Casper, Forensic Medicine, vol. ii.

4 Taylor on Poisons; Christison on Poisons; Birch-Hirchfeld, Lehrbuch der Pathologischen Anatomie.

5 Wood, Therapeutics, Materia Medica, and Toxicology; John J. Reese, Manual of Toxicology; Oesterlen, Heilmittellehre; Taylor on Poisons; Woodman and Tidy, Forensic Medicine; Birch-Hirchfeld, Lehrbuch der Pathologischen Anatomie.

6 Oesterlen, Heilmittellehre.

7 Wood, Therapeutics, Materia Medica, and Toxicology; Oesterlen, Heilmittellehre; Birch-Hirchfeld, Lehrbuch der Pathologischen Anatomie.

8 Woodman and Tidy, Forensic Medicine.

9 Taylor on Poisons.

10 Oesterlen, Heilmittellehre.

11 Christison on Poisons.

intense injection of the blood-vessels;[1] the bronchi are filled with frothy mucus;[2] more or less hyperæmia of the lungs may always be expected;[3] they are very often found in a state of œdema;[4] still more frequently hypostases and hepatization are discovered in their posterior and inferior portions.[4]

The liver, kidneys, and spleen are usually found loaded with venous blood.[5]

The presence of alcohol may be detected in the liver even after it has entirely disappeared from the stomach and all the other organs with the exception of the brain, for it is these two organs which show the greatest affinity for it.[6]

Nearly all authorities state that the veins of the cerebrum and cerebellum together with their membranes are engorged with blood.[7] According to Birch-Hirschfeld, however, the substance of the brain itself is frequently found anæmic and œdematous.

According to some an effusion of serum[8] is frequently found within the ventricles or beneath the arachnoid, and according to many others an effusion of blood[9] is very apt to take place, especially in the latter locality. It is probably somewhat doubtful how frequently these effusions take place in the most acute cases. The statement that hæmorrhagic apoplexy occurs quite constantly seems to be founded on a very limited number of cases.

Through the kindness of Dr. Harris and Dr. Amory, of this society, I have been enabled to obtain the autopsy records of two cases of undoubted acute alcohol poisoning, which fell into their hands for examination, and Dr. Wood, of the Medical School, has kindly furnished me with an account of the result of the chemical analyses in the same cases. Dr. Draper has also published an account of the examination of a more or less chronic case in the Transactions of this society, volume i., No. 1.

Dr. Harris's Case.—Two women of bad character were induced in the evening by sailors to go on board a vessel lying at one of the wharves, where they drank a large quantity of Spanish rum, known as aguadiente. At two in the morning one of the women was found dead.

Autopsy fourteen hours after death.

Rigor mortis marked. Lividity of dependent portions of the body. An abrasion of the mucous membrane in the lower part of the vagina, one by one and one half inches was discovered. No other marks of violence.

[1] Boehm, Ziemssen.

[2] Carpenter on Alcohol.

[3] John J. Reese, Manual of Toxicology; Casper's Forensic Medicine; Woodman and Tidy, Forensic Medicine and Toxicology; Wharton and Stillé's Medical Jurisprudence; Lallemand, Perrin, et Duroy, Alcohol et des Anesthésiques.

[4] Boehm, Ziemssen.

[5] Carpenter on Alcohol.

[6] John J. Reese, Manual of Toxicology.

[7] Oesterlen, Heilmittellehre; John J. Reese, Manual of Toxicology; Wharton and Stillé's Medical Jurisprudence, Part I.; Casper's Forensic Medicine; Taylor, Treatise on Poisons; Birch-Hirschfeld, Lehrbuch der Pathologischen Anatomie; Lallemand, Perrin, et Duroy, Alcohol et des Anesthésiques.

[8] Oesterlen, Heilmittellehre; Carpenter on Alcohol; Taylor on Poisons; Manual of Toxicology, John J. Reese.

[9] Wharton and Stillé's Medical Jurisprudence; Tardieu, Étude sur l'Empoisonnement; Taylor on Poisons; Woodman and Tidy, Forensic Medicine and Toxicology; Christison, Treatise on Poisons.

Section. The lungs were bound to chest walls, especially posteriorly, by not very firm adhesions. The heart presented no very unusual appearances except that the muscle was a little lighter colored than usual. The abdomen contained about one ounce of dark-colored fluid. The lungs were slightly congested, and the bronchi contained a little frothy mucus.

The kidneys were firm, quite dark in color, with the pyramids very strongly marked. The internal surface of the stomach was intensely congested, the contents (about two ounces) smelling strongly of rum. The brain was of normal consistency, the vessels of the pia mater not overloaded; the puncta cruenta were, however, strongly marked. The uterus contained free, dark blood, and in the right ovary was a corpus luteum of menstruation. The intestines and bladder presented nothing unusual. The spleen presented appearances of old inflammation. The liver, brain, stomach and contents were reserved for chemical analysis, the kidneys, part of heart and uterus for microscopical examination.

Dr. Wood isolated from the contents of the stomach one half cc. of alcohol, 0.825 specific gravity, which contains eighty-nine per cent. of absolute alcohol, and from one half of the brain two cc. of alcohol of the same strength. This corresponds to four cc. in the whole brain, and since eighty-nine per cent. is about double the strength of ordinary spirituous liquors, the amount found in the brain corresponds to about eight cc. of ordinary liquor.

Dr. Amory's Case. — A man about forty-two years old left home in the company of a friend. Two hours later, after visiting a number of places where liquor was sold, and drinking freely, he was brought home in a comatose condition, and died shortly after.

Autopsy seven hours after death. Body well developed. Face livid. A superficial cut just beneath left orbital ridge, from which a small quantity of blood was slowly oozing. Thick layer of fat under the skin. The deceased wore a truss for double inguinal hernia. Left inguinal canal open, the right closed. Diaphragm on the right side opposite the fourth rib and opposite the fifth on the left. Pigmentary deposits in both lungs. Old pleuritic adhesions on posterior surface of right lung, chiefly confined to the lower lobe. Pericardium contained about one half ounce of serum. Left ventricle contracted, right flaccid. Mitral valve admitted two fingers with difficulty, tricuspid three readily. No clots in heart or large vessels. The posterior portion of the lower lobe of right lung engorged with blood, but pressure caused crepitation. A small cyst about the size of a pea on the periphery of right kidney. The external surface of stomach considerably congested, the internal intensely reddened, showing the action of some irritant substance. The rugæ quite prominent. The contents consisted of fragments of meat, potatoes, and carrots, and about one and a half pints (by estimate) of fluid smelling of alcohol. No clot found in any part of body or blood-vessels. Vessels of pia mater moderately filled with blood.

Dr. Wood isolated from the contents of the stomach $33\frac{1}{3}$ cc. of eighty-nine per cent. alcohol, and about one half cc. of the same strength from one half of the brain.

The medical examiner meets with another class of cases much more fre-

quently than with the preceding. These are cases in which the subjects have been addicted for a long time, during life, to alcoholic excess and have died during a debauch, the immediate cause of death being either some exposure to cold, some chronic disease caused by the long-continued use of alcohol, or the continued dose of alcohol in a system already very much weakened by its excessive use.

In these cases one is apt to meet with certain appearances which belong to cases of acute poisoning, if alcohol has been recently taken, such as redness of the gastric mucous membrane, fluidity of the blood, etc., and either few or many of the signs of chronic poisoning may also be present, but no one of them is constant or pathognomonic.

ON POINTS OF INTEREST IN THE CASE OF JENNIE P. CLARKE.

BY MEDICAL EXAMINER J. G. PINKHAM, M. D.

On the 27th of February, 1879, at about five P. M., an old trunk containing a dead body, afterwards proved to be that of Jennie P. Clarke, of Boston Highlands, was found on the eastern bank of the Saugus River, in Lynn, a few hundred feet below the bridge on the main road leading from Lynn to Boston. The trunk had been weighted with several bricks, and three old porter bottles, one of which, by a curious miscalculation, as it appeared, was empty and corked, thus acting as a buoy. The nose of the victim had been severed by a clean cut, extending from the bridge downwards through bones and cartilages, with the obvious purpose of preventing the recognition of the body in case it should be discovered. That this mutilation was accomplished after death I assured myself from the fact that there was no injection of the edges of the wound, no retraction of the skin, and no traces whatever of the copious bleeding which must inevitably have occurred had it been effected during life.

The hair had been cut, recently and hastily as it appeared, inasmuch as the ends were irregular, and some loose masses adhered to the person of the deceased.

An autopsy held a few hours later developed the fact that the woman had died of peritonitis following, or accompanying, an abortion.

The probable conclusion that this was a case of criminal abortion was one readily arrived at; for the apparently desperate efforts made to conceal the body, and to prevent its identification if found, were in themselves a confession of crime. It was winter, and the frozen state of the ground would render secret burial difficult; an open burial could not be had without a certificate of death, which the guilty parties evidently could not well obtain without risk of exposure. The conclusion, then, that a crime had been committed having been reached, the problem of determining who committed it was one for the officers of the law, with the assistance, perhaps, of the medical examiner, to solve. The task proved in this case to be no easy one, the chief obstacle arising from the fact that for several weeks no identification of the body could be established; but detective skill at last triumphed; and the felony was laid at the door of one Mrs. Goodrich, who was practicing as a clairvoyant physician on Lagrange Street, Boston, a certain "Dr." Kimball, also of Boston, and another man, the supposed seducer of the girl, being named as accessories. These parties were promptly indicted by the grand jury, and the two former

[1] Read at the Annual Meeting of the Massachusetts Medico-Legal Society, June 8, 1880.

brought to trial in September, 1879. The array of evidence was overwhelmingly against the accused, but, thanks to our absurd system of jury trials, they were not convicted, the jury standing eleven for conviction to one opposed. The only reason the one obstinate juryman would give for not agreeing to convict was that no one saw the parties perform the criminal act. A second trial, which occurred in October following, resulted in the conviction of Goodrich and Kimball, and they are now serving out their sentences, the former of ten and the latter of seven years' imprisonment. The other accessory has never been tried. There was little of medico-legal interest developed at the trials, the principal line of defense adopted by the counsel for the accused not involving the necessity of overthrowing the medical testimony. It was shown, however, by the witnesses for the government, that Jennie P. Clarke was in the fourth month of pregnancy; that she left the place where she was at service in Boston Highlands on the 12th of February, and went directly to the house of Mrs. Goodrich, on Lagrange Street, where on the same day she was operated upon by Mrs. Goodrich, in some manner not ascertained, for the purpose of procuring an abortion; that at 9.30 A. M., on the following day, February 13th, she went to the house of Miss Forsythe in Somerville; that on her arrival at this place she seemed to be suffering from "a cold;" that on February 14th she was taken quite ill, and "had pains all through her;" that she aborted on the 18th, and, after suffering in the manner usual in cases of puerperal peritonitis, died at two P. M., February 25th; that on the 26th the nose and hair were cut off by Kimball, the body packed into the trunk, and, on the night of the same day, which was dark and rainy, taken in a carriage to the bridge before mentioned and thrown over the railing into the water.

So much for history. I come now to the consideration of some points of especial interest in this case. I do not think it necessary to weary you with all the details of the autopsy, but will bring out the essential facts, as they are needed in the discussion.

IDENTIFICATION OF THE BODY.

In their efforts to prevent the identification of the body the criminals in this case manifested considerable shrewdness in cutting off the nose; for the effect of depriving the face of this important feature is very largely to destroy its characteristic expression. I show at this point two pictures of Jennie P. Clarke, one taken when in health, the other from the dead body several days after the autopsy. In the latter the teeth appear much more than when the body was discovered, owing to some post-mortem retraction of the lips, but otherwise the likeness is quite accurate. While I was making the autopsy a member of the police force in Lynn confidently asserted that the body was that of one Miss C., who was known to be pregnant, who had declared her intention of getting rid of the fœtus, and who had disappeared from among her friends some two weeks previously. She had preferred a charge of bastardy against a certain party, and thus these facts became known to the police, who had kept watch of her. In order to make assurance doubly sure, a brother-in-law of the young woman was sent for, and the autopsy suspended to allow him to look upon the face. He came in, excited and trembling, and

after some hesitation declared his belief that the dead body was that of his wife's sister; but a few hours later she was found in a boarding-house, concealed from her friends and just recovering from an abortion. This was only the beginning of a long series of positive identifications, all but the last ending either in finding the person alive, or in the development of some other circumstance which disproved the supposed identity. One man from a neighboring town declared the remains to be those of his daughter, who was missing from home, he being convinced to the contrary only by the discovery of the erring one in a house of ill-fame in Boston. Another man was sure that it was his niece, but she, too, was found. In my opinion these strange mistakes were the result of the peculiar effect produced by cutting off the nose. Had the mutilation been carried so far as to destroy all the features, those who were seeking to identify the body would have been obliged to depend upon some mark or scar, and in this they would be much less likely to be deceived, although such an occurrence would be quite possible. In death, of course, those peculiarities of expression which result from the play of the facial muscles, and from the eyes, are lost entirely. Jennie Clarke was of medium size, had tolerably regular features, and brown hair, — a description, in brief, which applies to a very large number of young women. Imagine these faces deprived of their living expression, and of their most prominent feature, the nose, and you can understand to what a condition of uniformity all would be reduced, and what confusion might arise from the attempt to identify. As it proved, in this case the witnesses to the real identification, while asserting that they recognized the body from its general features, yet had all of them some mark or scar upon which they depended to fortify their conclusions. Among the points mentioned were a small, smooth, somewhat pigmented wart upon the back of the left hand; seven very small moles on the inner aspect of left fore-arm; a linear scar on the left side of the neck caused by the lancing of an abscess; the slight overlapping of the front teeth, etc.

With a stupidity only equaled by that shown in using a bottle empty and corked as a sinker, the girl's ear-rings had been allowed to remain in their places, the corresponding pendants being afterwards discovered at home. These were recognized by a number of persons, and formed an important link in the chain of evidence establishing the identity. Facts like these show the importance of noting, at the autopsy of an unknown person, every peculiarity of appearance, however trivial, that may in any way serve as a means of recognition. A similar importance, in my opinion, attaches to measurements of the body, the length of the arm, the circumference of the neck, of the chest over the nipples, of the waist and hips, the length of the body, a shoemaker's measurement of the foot, etc.; for in case of non-identification before the destruction of the body by the process of decay, these, as serving to show whether certain garments would fit the deceased or not, might be of the greatest value.

AGE.

The general appearance of the body of Jennie P. Clarke was that of a young person. The hair presented no trace of gray, the skin was fair and free from wrinkles, and the teeth in general well preserved. But this descrip-

tion, obviously, might apply to a woman anywhere from the age of maturity to that of forty or perhaps forty-five, and could not be relied upon as furnishing data for any calculation approaching exactness. Owing, perhaps, to the effect of the final illness upon the face, the tendency in this case was to overestimate the age. Some even placed it between thirty and forty. But, as it happened, more reliable data for determining the age were furnished by the *dentes sapientiæ.* On making a thorough examination, after relaxation of the jaws had occurred, it was found that the wisdom teeth of the upper jaw had emerged, while those of the lower jaw were still beneath the gums. One of the latter appeared to have been just on the point of emerging, for on making an incision through the gum it came in sight. The wisdom teeth are said by authorities to appear usually between the ages of seventeen and twenty-two. They manifest, however, great irregularities in regard to the time of their eruption. An intelligent dentist informed me that he had been not unfrequently consulted by persons from twenty-five to forty years of age, who were having trouble with the eruption of their wisdom teeth. Occasionally one or more of them never appear at all, and they may emerge before the age of seventeen. They are liable to decay early, it being no unusual circumstance for them all to be lost within a few years after their appearance. In such a case one might, perhaps, be deceived by their absence into the belief that they had never appeared. So, also, if one of the other molars should be lost early in life, the gap in this way made might be filled by the eruption of the remaining teeth, and thus, there being but two molars present, the wisdom tooth, in the absence of any of the characteristic appearances of the crown, might be mistaken for the second molar, and the erroneous conclusion arrived at that the former had not emerged. The medical examiner, always on his guard, as he must be, against such sources of error, can make himself sure in regard to all these points by dissection. The conclusion in this case, based upon the statement of averages by the authorities, was that the girl was not far from twenty years of age, and this proved to be correct.

It was not thought necessary to seek for any additional evidence in regard to the age in the skeleton, for this would not perish for a long time, and could, if any important question should arise and make it seem advisable, be subsequently examined.

CONDITION IN LIFE.

The body was clothed in a coarse white cotton night-dress trimmed with Hamburg edging, and a cheap-looking merino under-vest. The person of the deceased had evidently been well cared for by herself during life, as the finger and toe nails were short and clean, while the ears, scalp, and teeth, parts usually neglected by the uncleanly, showed no traces of neglect. The hands were delicate, and there were no calluses upon the fingers or palms indicating that the deceased had been accustomed to any employment likely to cause a thickening of the cuticle. We could not thus exclude housework from the list of possible occupations, for the reason that the frequent soaking of the hands in soap and water, as in washing clothes and dishes, would have a tendency to prevent the formation of calluses. From the facts given we were, I think, justified in inferring —

(1.) That the deceased was in humble circumstances.

(2.) That she did not belong to what can properly be styled a low class.

That she was not a prostitute, unless, perchance, she might be just beginning a career of shame, seemed probable from the fact that she had aborted; for it is well known that confirmed prostitutes seldom conceive, or if they do, that they abort at the next succeeding menstrual period, as a result of the constant sexual excitement to which they are subjected, without being themselves aware of their pregnancy. And besides, the probability was extremely small that any such desperate efforts would be made to conceal the dead body of one who was known as a *nymphe du pavé*, for her bad character would in all likelihood be relied upon to prevent any interest being taken in her death, or investigation made of its cause. As subsequently ascertained, Jennie P. Clarke was a domestic in a family of moderate means.

TIME OF DEATH.

Granted the complete cooling of a body, the time of death may be approximately determined by the presence or absence of cadaveric rigidity and of the signs of decomposition. In the case under consideration the body was, when discovered, frozen, the more exposed parts, as the extremities, quite firmly, those protected by the clothing to a less degree. Around the abdomen was a swathe and beneath this the flesh was very slightly frozen. All the joints were stiff, whether from the freezing or rigor mortis, or both combined, I was unable at the time to decide. In straightening out the body to place it upon the table nearly all the large joints, which were in a state of flexion, were forcibly extended; and these thereafter retained their flexibility; but when thawing of the flesh had occurred it was found that the jaws, and other joints which had not been disturbed, retained for a time their rigidity, thus proving that the rigor mortis had not departed. Caspar says, "The stiffness of a frozen body can never be confounded with the rigor mortis; for a frozen body is from head to foot as stiff as a board, while in cadaveric rigidity the extremities, particularly at the elbow and knee joints, always preserve a certain amount of mobility."[1] Surely he cannot mean this statement to apply to a partially frozen body, nor would he accuse of unpardonable dullness one who in such a case was unable to render an immediate decision.

The presence of cadaveric rigidity would place the body in the second period of Devergie, and lead to the inference that death had occurred from ten hours to three days previously.[2] But evidently great caution was to be exercised in drawing such a conclusion, because the extreme cold to which the body must have been subjected to produce freezing would, if it did not hasten the development of cadaveric rigidity, certainly retard its departure. A similar effect might be expected from immersion in cold water.[3] At low temperatures (36° to 45° F.) bodies have been known to retain their rigidity for eight or ten days. Below the freezing point they might, perhaps, retain it much longer.

[1] Forensic Medicine, vol. i. p. 30.
[2] Taylor's Principles of Medical Jurisprudence, vol. i. p. 89.
[3] Ibid., page 56.

The body was quite fresh in its general appearance. There was a bluish-green discoloration of the loins, extending at some points over the abdomen nearly or quite to the median line of the body. The skin of these parts was elsewhere of a vivid red. A bad odor was perceived about the genitals, but the subsequent developments as to the cause of death showed that this odor could not reasonably be regarded as the result of post-mortem change.

A greenish discoloration of the abdomen is mentioned[1] as the first sign of commencing putrefaction, and it appears, on an average, in from one to three days after death. But in estimating the value of this sign in any given case the temperature is obviously to be taken into the account. On the 27th of February, the day on which the body was found, the temperature, as recorded at the City Hall in Lynn, was, at eight A. M., 24° F.; at one P. M. 24° F.; at six P. M. 23° F. The maximum for the twenty-four hours ending at eight A. M., February 28th, was 27° F., and the minimum 7° F. Thus we see that for twelve hours at least, previous to the autopsy, which took place at eight P. M., the body was exposed to a temperature considerably below the freezing point, and that any putrefactive change would be out of the question. This is based upon the supposition that the trunk had been in its position on the bank of the river during the whole of that day. This is measurably certain, because it had been seen quite early in the morning by a person who thought it a pile of drift-wood, or something of the sort. On the 26th of February the maximum temperature was 49° F., and the minimum 22.5° F. On the 25th the maximum was 35° F., and the minimum 15° F. Previous to this the weather was still colder. We could not of course tell with certainty in what condition the body had been kept before it was thrown into the river, but as the universal custom is to put dead bodies, lightly covered, into a cold room, with, perhaps, the windows open, we are at liberty, I think, to assume that this body had been kept continuously at a temperature which would render the process of putrefaction a very slow one. But there is still another circumstance to be considered. The autopsy proved the existence of an intense peritonitis. It is well known that those parts that are inflamed at the time of death take on the putrefactive process more readily than healthy tissue. Sometimes, indeed, it begins before death, as when gangrene occurs. And in this case, also, the septicæmia, which, perhaps, invariably accompanies puerperal peritonitis, would predispose the body still more strongly to the putrefactive change. The temperature of those dying of an acute infective disease is often very high. Is it not possible that the greenish discoloration of the abdomen in this case, the first sign of putrefaction, as it is called, might have arisen between the time of death and that of the entire cooling of the body? If we should allow the increased tendency to putrefaction resulting from the mode of death to offset the retarding influence of the low temperature, and fall back upon our averages, we should infer that death had occurred from one to three days previously, the same conclusion essentially as that arrived at from the presence of the rigor mortis. As it proved, the girl had, at the time of the beginning of the autopsy, been dead just fifty-four hours, two and one fourth days.

[1] Caspar's Forensic Medicine, vol. i. p. 38. Taylor's Medical Jurisprudence, vol. i. p. 93.

CAUSE OF DEATH.

The cause of death has been already stated as peritonitis following or accompanying an abortion. A brief statement of post-mortem appearances, taken in substance from the record of the autopsy, will show upon what evidences this conclusion as to the cause of death was based: On laying open the abdominal cavity a thin, bloody serum exuded. The peritoneal membrane was everywhere injected, and in places, particularly over and in the neighborhood of the liver, covered with a layer of lymph. The pelvic cavity was partially filled with thin, fœtid pus. The pelvic organs were matted together, and covered with a shreddy layer of lymph. On the left side was a sort of sac, formed by adhesions of opposed peritoneal surfaces, and filled with pus. This bag of pus was at first mistaken for an abscess, but a careful examination revealed its true character. The appearances described would warrant the inference that the inflammatory process began somewhere in the pelvic cavity, and that it had extended, but a short time before death, to the parts above the brim. The proofs that an abortion had occurred may be summarily stated as follows: —

(1.) The vulva was dark-colored and open, and emitted a bad odor. The vagina was injected, intensely so in its upper part. The os uteri was patulous, sixteen mm. in breadth, margins soft and black.

(2.) The interior of the uterus was covered with a black, shreddy slime. On the right side, near the fundus, was a rough, raised, spongy-looking portion, obviously the point of a placental attachment.

(3.) The uterus was enlarged. Its dimensions, as given below, were taken after it had been kept for some months in alcohol, and must be regarded as slightly reduced from those which existed at the time of the autopsy: —

Outside length	125 mm.
Outside breadth (greatest)	80 mm.
Cavity of cervix, length	45 mm.
Cavity of body, length	65 mm.
Total length of uterine cavity	110 mm.
Breadth of cavity (greatest)	55 mm.
Thickness of wall, cervix	13 mm.
Thickness of wall, body	14 mm.
Thickness of wall at placental site, right side (not including the spongy mass)	17 mm.
Idem on left side opposite placental site	10 mm.
Idem at fundus (prolongation of line of internal measurement)	15 mm.

(4.) The ovaries were dark purple, and in the left was what appeared to be a true corpus luteum of pregnancy, it being superficial in location, firm in texture, easily enucleated, and presenting on section a bright orange-yellow convoluted wall, 2.5 mm. in breadth, and a glistening white clot with a central cavity. Its greatest length was 21 mm., and breadth 14 mm.

(5.) The breasts were full, and presented areolæ of a light-brown color, with a few papules. On pressure milk exuded in considerable quantity from both breasts.

In view of all these facts it was to be regarded as certain, from a medical point of view, that an abortion had occurred, and that the inflammation which was the direct cause of death was its sequence.

REPORT OF THE EXECUTIVE BOARD

ON THE WORK OF THE MEDICAL EXAMINERS FOR THE YEAR 1879.

In behalf of the executive board, the following report is presented: —

The statistical details which the Massachusetts Medico-Legal Society are enabled to present, through the medium of this report and those of the previous years of its existence, constitute a summary of work which has not been compiled for public presentation before the organization of this society. A certain portion of these statistics are necessarily devoid of medico-legal characteristics. This must always be true, in consequence of the varied nature of the cases which are presented for the official cognizance of the medical examiner. The ability to discriminate correctly between natural and violent deaths constitutes the chief advantage which a professional training has given to the medical examiner over the coroner of olden time.

As an organized body we are (through the voluntary reports of the members of this society) in possession of the essential facts pertaining to the majority of cases of death, of an accidental, suicidal, or violent nature, occurring in Massachusetts since July 1, 1877.

It is worthy of note that the State has never attempted the collection of data in regard to coroners' inquests in former years; the only records of inquests being such as are scattered throughout the various county court houses, in the shape of expense accounts and records of testimony.

The executive board therefore request your cordial coöperation in continuing the reports already begun, and contributing them in such form as shall be acceptable to the society.

During the past year the executive board have begun the work of filing and indexing all the reports in their possession. The work for the last six months of 1877 and for the year 1878 is completed, and that for 1879 nearly completed, the whole forming six volumes, contained in bound letter-books of appropriate size. Each medical examiner's annual report appears by itself, and also the special report of views and autopsies. These reports, for the sake of future reference, are all carefully indexed, each reference containing the name of the "person found dead," when the name is known, the name of the town or city where the body was found, the medico-legal diagnosis, and the page of the volume where the report is inserted.

These volumes have been deposited in the Medical Library, by the permission of the Medical Library Association, and in accordance with the instructions of this society.[1]

[1] Vide Transactions of the Massachusetts Medico-Legal Society. No. 2. Appendix C.

Of the fifty-six medical examiners who have been members of this society during the past year, forty-seven have reported their work for 1879, either partially or in full, to the corresponding secretary. Of this number, thirty-two have sent complete returns, including both annual returns and reports of special cases; three have sent special reports only, and twelve have rendered annual reports only. Two medical examiners have given no return of autopsies, although these were indicated in their annual reports.

From the returns of forty-seven medical examiners we compile the following results: —

Total number of views made during the year	770
Number of views followed by autopsy	182
Inquests held, on recommendation of the medical examiner	151
Inquests held without his recommendation, and not in railroad cases	1
Inquests at which medical examiners testified	75
Cases reported by medical examiners as probably resulting from violence, in which no inquest was held	22
Deaths from natural causes	302
" " railroad accidents	90
" " other accidents	232
" " suicide	122
" " violence	54
Prosecutions resulting	13
Convictions resulting in cases now finished	4

The relative proportion of views to autopsies and inquests is as follows: —

In 1877 (six months).		1878.	1879.
Views,	443	828	770
Autopsies,	116 = 26 + %	196 = 23 + %	182 = 23 + %
Inquests,	99 = 22 + %	172 = 20 + %	151 = 20 + %

The variation in the causes of death is more noticeable: —

	1877.	1878.	1879.
Natural causes,	23 %	39 + %	38 %
Railroad accidents,	17	14	11
Other accidents,	29	25 +	30
Suicide,	16	11	16
Violence (by another)	11	8	7

The deaths included in this report are, for convenience of classification, distributed under the following groups: (1.) Deaths by accident. (2.) Deaths by violence (the act of another). (3.) Deaths by suicide. (4.) Deaths by natural causes.

These groups are also susceptible of divisions and sub-divisions as follows: —

Deaths by accident: —

Of these there were by railroad injuries	83 [1]
" " " drowning	98

(Of this number five were in consequence of shipwreck.)

There were by poison fourteen: —

Of which number there were from laudanum	3
" " " " lobelia	1
" " " " chloral hydrate	1
" " " " chlorate of potassa	1

[1] The apparent discrepancy between this portion of the report and the former or general portion is accounted for as follows: In the former portion the entire number of railroad accidents is included; in the latter, only those which are specified in the reports of individual cases.

Killed by a fall	41
Killed by falling bodies	13
Run over by a team	7
Killed by injuries from machinery	3
Killed by shooting	4
Killed by kick of a horse	1
Killed by hanging	1
Killed by running against another person	1
Killed by elevator accident	1
Killed by asphyxia from fire or smoke in a burning building	9
Killed by scalding	5
Killed by burning	4
Killed by boiler explosion	3
Killed by freezing and exposure to cold	6
Killed by an injury not specified	1
There were also, by overlaying, or suffocation under bedclothes (all young infants)	12
Killed by instrumental delivery (infants)	2

Fifteen accidental deaths occurred in the afternoon of July 16, 1879, during a severe gale, in which fourteen persons were drowned in Boston Harbor, and one person was killed on shore by a boiler explosion. Others were also drowned at the same time, but no special reports were received other than those enumerated: —

Deaths by violence (the act of another) were as follows: —

By blows on the head	5
By criminal abortion	3
By shooting	2
By stabbing	1
By fracture of patella (followed by delirium tremens)	1
Mode of injury not stated	2
By infanticide, including various forms of violence	7

Suicides occurred as follows: —

By hanging	26
By shooting	22
By drowning	20
By cutting throat	12
By leaping from a height	2
By strangulation with a handkerchief	1
By poison	15
Opium in some form	5
Paris green	6
Cantharides[1]	1
Chloral hydrate	1
Prussic acid	1
Corrosive sublimate	1
Mode unknown	1

Sixteen suicides were known to have been insane. The ratio of suicides to population in 1879 was about one to thirteen thousand. There were three deaths from suicide in one small town of seven hundred inhabitants.

Deaths from natural causes were distributed thus: —

Heart disease	52
Apoplexy	18
Epilepsy	6
Phthisis pulmonalis and hæmoptysis	14
Pneumonia	8

[1] Reported in full in Boston Medical and Surgical Journal, January 26, 1880, page 107.

Pulmonary œdema	3
Acute bronchitis	2
Convulsions	3
Peritonitis	3
Alcoholism and delirium tremens	15
Thoracic aneurism	3
Starvation	4
Diarrhœa	3
Old age	3
Exhaustion	2

Cholera morbus, rupture of aorta, typhoid fever, whooping-cough, croup, disease of liver, septicæmia, abortion, sunstroke, and death under ether, one each.

Sixty-eight deaths were reported as the direct or indirect result of intoxicating drinks.

Infantile group of deaths from natural causes: —

From premature birth and still-birth and various causes among children under one week old	31
Cholera infantum	1
Marasmus	1
Invagination of intestine	1
Causes unknown	4

Five cases of deaths of infants were investigated at the request of the Massachusetts Society for the Prevention of Cruelty to Children.

Two points of special interest are noticeable in the report of the past year: —

The increase in the number of suicides by Paris green. This poison has become more widely known of late years in consequence of its vermin-destroying properties. Its poisonous properties are familiar to all persons who own a potato patch, whether large or small. No deaths from its use were reported in 1877 or 1878.[1]

It is also a singular fact that the note of the last corresponding secretary in relation to the notable absence of deaths from overlaying among infants, in 1878, should have been followed by a marked increase in 1879, one only being reported in the former year, and twelve in the latter.

[1] The notes of an autopsy in a case of suicide by Paris green are appended to this report: —

Record of autopsy. Margaret B., aged twenty-two, nineteen hours after death, and sixty-seven hours after ingestion of the poison.

Nothing remarkable on external examination. Heart normal in size and in regard to valves; pale and friable.

Both lungs œdematous posteriorly and inferiorly.

Abdominal cavity contained one hundred and thirteen cubic centimeters of red serum. Pelvic peritonæum injected. Intestines moderately distended with gas. Slight injection of mesentery and intestinal mucous membrane.

Œsophagus showed dark, brownish-red patches along lower parts of its mucous membrane. No erosions.

Stomach normal externally. Its liquid contents measured one hundred and seventy cubic centimeters, of consistency of pea soup, of a dark, grayish-brown color and grumous, viscid appearance. The mucous membrane of the stomach was not eroded, or distinctly reddened. At the posterior inferior portion (fundus) were many submucous punctate ecchymoses.

Both kidneys were moderately increased in size; cortex infiltrated; streaked with fine, whitish-yellow lines; injected (fatty degeneration).

Spleen normal.

Liver pale; of normal size; edges rolled outward on section (fatty).

Contents of intestines of an olive-green color and creamy consistence. (Patient had taken hydrated sesquioxide of iron freely.) Pelvic organs presented nothing remarkable.

Brain not examined.

NOTE.— Remarkable absence of lesions after swallowing ten cents' worth of Paris green.

TRANSACTIONS

OF THE

MASSACHUSETTS

MEDICO-LEGAL SOCIETY.

VOLUME I.—NUMBER 4.

1881.

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ADDRESS ON THE HISTORY AND WORK OF THE SOCIETY.

DELIVERED OCTOBER 5, 1881.

BY ROBERT AMORY, M. D., PRESIDENT OF THE SOCIETY.

GENTLEMEN OF THE MASSACHUSETTS MEDICO-LEGAL SOCIETY, — It is now four years since the medical examiners' law went into effect, and upon this fourth anniversary of the organization of our Society I desire your attention to a review of its operation; but first let me preface my remarks. The abuse of the old principle of a coroner's jury led, as you are well aware, to the present change in the system of legal inquiry into the cause and manner of suspicious death, and an attempt has been made by the legislature to divide this inquiry between two officers; and placed first in order of inquiry was the determination of the medical cause of the suspicious death, and, second, the juridical exposition of the responsibility for this death. Our duty as medical examiners being concerned in the successful operation of the present law, we should, from time to time, endeavor to ascertain whether the object provided for in the first-named division is constantly and properly carried out.

Can a correct explanation of the cause of death in cases of supposed violence be as well obtained under the present as under the old system of investigation? Our able associates have informed us that, theoretically, the answer to this question is affirmative, but its practical proof is better known to us than to others, and is sufficiently attested by an appeal to the annual returns of our own active members, which have been duly summarized in turn by your executive committees, and now are deposited in this medical library.[1]

The statute requires that the medical examiners must be "able and discreet men, learned in the science of medicine," and "shall be liable to removal from office at any time by the governor and council for cause shown." Consequently, any one holding this commission cannot plead inability to ascertain any cause of death which is now familiar to the best pathologists; hence, if upon simple view of a dead body he has a reasonable opinion of the cause of death, whether by natural means or by violence, he may immediately take appropriate action, and if by the latter he shall then state his opinion in a communication to the trial justice; but if he cannot thus readily satisfy his own mind the law provides that the medical examiner may, after obtaining proper authority, examine the corpse post mortem. Thus it would seem as if every means were placed in the hands of the medical officer to form, so far as human

[1] At 19 Boylston Place, Boston.

skill will allow, a correct judgment of the cause of death. Yet we must not forget that our present knowledge of the causes of death is very far from complete, and that some cases will arise, and even have already arisen, as most of us who have had any practical experience in these affairs will confirm, wherein even medical science fails to elucidate the doubt. Unfortunately the community expects more knowledge from the medical practitioner, not only of the causes and cure of disease, but even of the causes of death, than we have any right to pretend to. Now, under the old law it would, at first sight, seem just to expect that a jury of medical men, under the authorized investigation of the coroner, would more correctly arrive at a definite conclusion of the cause than would the present medical examiner by his own unassisted inspection and judgment. This is, however, a fallacy, because, in the first place, it was very difficult for the coroner to get an intelligent medical jury, and so most usually the jury was composed of some men who were educated in medical knowledge and of some who had none of this knowledge, hence the verdict was confusing and perplexing. Again, it must be admitted that medical men differ in judging similar circumstances, and hence sometimes a jury composed of medical men only would give a misleading verdict. Now, however, the medical examiner may form his judgment without interference from others. As this judgment of facts and results from inspection must be reduced to a written opinion it is susceptible of review and criticism, and hence will require care and truthfulness in its preparation. Having to form an opinion of the cause of death only, and not of its human agent, no technicalities of law come between him and his own conclusions.

Practically we must admit the wisdom of the principle of this legislation, for its workings and processes are simple, and are concerned with matters about which the medical practitioners of to-day should be thoroughly familiar. In brief, then, the medical examiner has simply to put into practical operation the faculties of observation which he employs daily, while he has nothing to do with learning upon whom the responsibility of criminal accountability may lie.

The brief synopsis I have thus given leads to the natural inference that the means offered by law for the correct explanation of the cause of death by supposed violence has proved an incalculable benefit to the community in general on account of the substitution of positive knowledge for speculative doubt. I might also cite the advantage that the present quiet and dignified method of procedure has over the now obsolete excitement caused by the coroner and the impanelled jury; the medical examiner privately examines and privately communicates the result of his examination. Moreover, the increasing amount of information obtained by the careful and close attention required throughout the State from those who investigate and report the diagnosis of the cause of death, is a benefit to medical education.

When the new law was first put in force, undoubtedly many cases were reported to the medical examiners which need not necessarily have been examined by them, for though the deaths were mysterious, the mystery was concerned only with natural causes, and not with those of violence; yet society required the medical examiner in these cases to certify as to the cause of death,

and oftentimes he was unable to do this without a post-mortem investigation. Our more recent experience shows that many of the cases which were at first, owing to this cause, included in our annual returns should never have been reported to the medical examiner. In these cases the fact must not be overlooked that it was wiser to err in cases of doubt upon the side of too much rather than too little investigation.

But just here let me call the attention of this Society to a fact of which many of you are apparently ignorant. In our archives is stored a very valuable amount of material for pathological study, as related in the reports of cases which are carefully indexed and arranged for easy reference. These cases should be examined and read for the information of our various members, who will learn much that is interesting to them in their official capacity, even if no mention be made of the advantages they possess for the medical practitioner. If many of these cases were known to you, much of the questioning made at our meetings as to the methods and conduct in certain unexpected official perplexities would appear to you superfluous, and very much that is interesting to scientific research would receive the attention of members who now rarely join in discussion. If the future of this Society is to be an important link in forensic medicine, more energy and active zeal is required from the county medical examiners, before whose eyes I am sure many interesting pathological questions have been brought, and from whom much valuable information can be obtained.

No one would hesitate to pronounce, from the knowledge we have gained in the practical study of the causes of death by supposed violence, that justice under the present process of our law is greatly facilitated in the acquisition of the actual determination of the causes which led to the death of the victims of crime. The picture which has so often been brought to the view of the individual members of our Society, in which is discovered the corpse of a person who apparently has met with a violent death, either from his own hands or that of others, is peculiarly vivid. Instead of hurriedly convening a jury from a gaping and curious crowd around the scene of recent violence, the medical examiner is hastily summoned, and rapidly proceeds to take charge of the body and to remove it quietly and decently to a secluded place; during the time that his application for an autopsy is being surveyed and considered by the proper authorities, he has time to summon two competent witnesses, who when practicable should always be physicians; then with locked doors he calmly and carefully makes the autopsy, reduced to writing by the aid of a qualified clerk, and from this record he draws up a clearly defined report which is immediately forwarded both to the trial justice and to the district attorney. Here end the functions of the medical examiner. It thereupon becomes the duty of the trial justice to make inquest as to the responsibility of the violent death, if it is shown in the aforesaid report that it was caused by the agency of man. After he has held an inquest the judge, or trial justice, gives his verdict, which is the first public announcement since the medical examiner was first summoned. Can anything be simpler? There can be no conflict of opinion, because on the one hand the medical examiner pronounces the medical causes of death, and on the other hand the judicial officer deter-

mines whether this cause implicates a problematical criminal responsibility. In order to fix the individuality of the responsibility, the district attorney lays the whole matter before the grand jury, which may or may not return a bill of indictment.

I hope the Society will pardon me for speaking thus in detail of matters which are as familiar to its members as they are to its president; but it is important that we should keep these facts always in plain view. I doubt very much whether our present reformed legislation would have waited so long for the law of to-day, if the coroners of the State had met together as often as has this Society, and thus have probably brought about the same reform as now exists. When we were first commissioned, we were all aware that the success of the medical examiner's law depended upon the ability and competency of the officers commissioned to carry out its provisions, and, being unacquainted with our new duties, naturally we met together and organized this Society. Does any one of its members for a moment realize that the success of the present law is assured? Do we not all of us, and each one, know that if we cease to exist as a society the influence we now exert upon the community will be seriously weakened, and the mutual benefit derived from interchange of views will be lost to us, and that future appointments to be made by the executive might be selected which would depreciate the qualifications of our successors? Do not understand me to impugn the character of the present, or any other chief executive of our State; but we all know that the appointments of county officers, and medical examiners are county officers, have been in more than one instance relegated to the councilor of the district, and the appointment issued upon his nomination. For this, even if for no other reasons, it becomes the duty of this Society to make its influence and power felt, not by scheming for successors to office, but by establishing a name for probity, earnestness, careful scientific research, and for the collection and storing of valuable information obtained by each one of its members. Nor let the work stop here; material facts and earnest work are of no great value, unless each one of us endeavors to increase our knowledge, not by questioning and answers only, but by earnest discussion of cases coming under our personal knowledge, or of those reported at our various meetings.

I have spoken of the advantage to the community and to justice in the present law concerning medical examiners. The advantage to the medical profession is also great. An authorized autopsy in case of a sudden death by supposed violence presents a means of study in pathological science which is invaluable. I do not wish to insinuate that in the new law the facilities for post-mortem investigations are any easier than under the old coroner's law; indeed, experience shows that the facilities for unnecessary dissection are not so great, but are only allowed for the better advance of the ways of justice, and needless autopsies are checked; yet the medical officer must examine carefully and deliberately, for his own reputation, and even still further, for the better guide to his written opinion, for which he alone, unsupported by a jury, must prepare himself. The result of all this is the collection of a very valuable series of post-mortem observations in many cases of death which have been caused by natural lesions; because there are many cases of death in which

violence is suspected which are proved by the autopsy not to have resulted from the hand of man. I doubt whether the autopsies held by coroners under the old law were as carefully conducted, because here the coroner had simply to charge his jury with such information as he deemed essential to their minds. which generally were not educated in medicine, and his jury gave its verdict, which was a brief summary of a preliminary examination to a charge of murder, or else simply a statement that the deceased came to his death by natural disease or by the hand of Providence.

It seems to me that the practical operation of this law has also relieved the district attorney of the weighty responsibility of deciding whether the coroner and his jury had sufficiently examined the medical aspect of the case, and in a way to assist him in his preparation for the court; while, again, he cannot help being satisfied with the verdicts rendered by the magistrate. Our associates, the district attorneys, can inform us, if they wish, whether or not, under the present law, the statement is not warranted that the facts of the crime and the cause of death are more truly set forth at present than in the old coroners' time. From what little has passed under my own observation I feel confident that these officers go into the investigation of their cases now with more satisfaction than was their wont six years ago. They feel pretty sure whether the victim came to his death naturally or by the hands of another. I cannot, however, forbear to mention, in this connection, that but few of these officers have lent much active help to our Society, and I regret that the professional demands upon their time and attention have apparently robbed us of their counsel at our meetings. From the little we have heard from them, I feel confident that we are being continually deprived of very valuable assistance which they could give to us if they would attend our meetings.

One great boon to the State, resulting from the medical examiner's law, will be duly presented to you in the report of your executive committee: This is in relation to the costs to the counties of inquests under the coroners' law, and under the new statutes. As this was the main argument which led to the abrogation of the old statute, and to the institution of the new law, I think you will be much interested in the material facts which we have been able to obtain from the various county commissioners. I will not forestall your interest in this portion of our review, but will simply say that the figures of costs, for three years, bear out the fact that the new law has been more economical than the old statute.

Thus we can claim for the advantages of our new legislation, after four years of its experience: (1.) That the investigation of the cause of death after supposed violence is unattended with the disagreeable and harassing circumstances of partial publicity which were necessary under the old coroners' system. (2.) A more certain and definite knowledge of the cause of death. (3.) An inquest under a magistrate who presents his verdict without the inconvenience of a jury. (4.) A written and detailed account, from both medical and judicial examiners, which forms a more convenient record for use by the district attorney in presenting the case before the grand jury. (5.) A financial saving to the treasury of the counties. (6.) An opportunity for study of pathological science.

I cannot refrain, moreover, from giving an outline of the work which your Society can accomplish. (1.) A mutual exchange of opinions which will serve to increase the administrative knowledge of the medical examiners. (2.) The elevation of the office of a medical examiner so that competent persons will be desirous of appointment. (3.) The collection of a valuable record of autopsies and statistics for reference by the general practitioners of medicine as well as by the medical examiners. (4.) The establishment of a discussion in forensic medicine among our profession, the lack of which has suffered this subject to be neglected in our State. (5.) The establishment of concerted action under the influence of which future appointments to office will fall to competent men. (6.) A censorship under whose censure incompetent officers shall be removed from their office.

I need not say that the maintenance of this Society and its objects requires much sacrifice of time and devotion to its interests on the part of its members, and it should be the duty of the officers of this Society to influence you individually and collectively to exertion and active zeal to promote these objects.

I owe you, gentlemen, an apology for myself in resigning my commission, and thus being deprived of lending an active support to this Society, but you must be aware that my absence from the State for nearly a quarter of each year would render me liable to the criticism that I was derelict in duty, and hence I felt obliged to vacate my commission, and at the same time to resign an active membership in your body; and, moreover, I deprive myself of the honor of being your president.

I cannot retire from this chair without expressing my thanks for the honor you have conferred upon me, and for the courtesy you have always extended to me, and hope that my successor in office will enjoy as much as I have done the work of conducting your meetings, as well as of maintaining the organization which my predecessor and myself first conceived soon after our commissions were given us. I shall always give you what support I am able, and shall always look with pride upon the written work which may be stored in your archives.

IN WHAT CASES SHALL THE MEDICAL EXAMINER DECLINE TO VIEW A DEAD BODY?[1]

BY MEDICAL EXAMINER ALFRED HOSMER, M. D.

THE medical examiner forms a conspicuous and important element in that vast system of protection which it has been found necessary to establish for the community. In one of his relations to the public he is, but in no menial sense, a servant, and as such he should be willing, prompt, and obedient. With this idea in mind I have never failed to report for duty whenever a requisition has been made for my official services. Yet it has sometimes happened that after reaching the place where immediate action on my part was expected, I have been forced to the conclusion that the case in hand not being among those contemplated and provided for by the statute of 1877, I had derived no authority from that act to take cognizance of it, and have therefore declined to hold a view in the legal sense of the phrase.

For instance, one morning a police officer requested me to give immediate attention to a case which had occurred five miles away, in the district of Medical Examiner ——, then absent. At much personal inconvenience I responded to the summons without delay. I found in the custody of the undertaker the body of an elderly man, who, early in the day, while in company with a friend, had died suddenly in the street. Careful interrogation failed to discover any suspicion that the death was not a natural one, and also elicited the statement that the deceased had recently consulted a neighboring physician. The fact that the death had been both public and sudden was assigned as the only reason for calling a medical examiner. Yet a little reflection will satisfy all that neither of these features in that case could be considered *per se* as proof of "death by violence." Sudden deaths from natural causes are unquestioned, although their frequency has not yet been exactly determined. Their origin and relations form a subject which deserves a full elucidation before this Society. Public deaths are not likely to be unnatural ones unless they occur under circumstances which plainly show their violent character. There can be no doubt as to the nature of the fatal results that follow a social disturbance, which may exist in any and all degrees, from a simple individual assault to a riot of the largest proportions. There is no difference of opinion as to the kind of death which overtakes the victims of a disaster or awaits those who lose their lives through that agency which, with a careless freedom of language, we are accustomed to speak of as accident.

[1] Read at the October meeting, 1880.

To return to the point whence this digression started, I sought the physician who had attended the deceased. On the demand of the instant he could not furnish the information I desired. He promised to investigate and report; in a very short time he wrote to me as follows: "Mr. —— had a marked stenosis of the mitral valve; was moderately comfortable with care. I learn that he had been drinking hard a day or two preceding his death." Such evidence as this fully confirmed me as to the correctness of the conclusion at which I had arrived, and upon which I had acted, when, in the presence of the dead body, I had expressed the opinion that the case did not come within the province of the medical examiner. There was no duty prescribed by law that I could perform, there was no service that I was qualified to render, and, rendering none, I considered myself entitled to no compensation, and have never claimed any.

An answer to the question which forms our subject must be obtained from a careful study of the law, of which the seventh section is as follows: "Medical examiners shall make examinations as hereinafter provided upon the view of such *persons* [1] *only* as are *supposed* to have come to their death by *violence*."

What is a death from violence within the meaning of the statute? In a general statement it is one with the causation of which human agency is connected directly or indirectly: through default of a reasonable and necessary precaution; through neglect to secure protection against danger known to exist or to be incurred; through force, mental, mechanical, medicinal, chemical, or toxic, exercised and applied either ignorantly and unconsciously, or under the impulse of excitement, without premeditation; or with deliberation and improper purpose. This definition requires some explanation and limitation, and will be better understood if we constantly bear in mind the fact that the high function of the medical examiner is to assist in the detection of *crime against life*. But the location of the line which separates guilt from innocence is fixed by the provisions of statute law. Violence of death has no constant relation to legal prohibition and penalty, and is not confined to the unlawful destruction of life. In deference to the necessity and the right of self-defense the shooting of an unprovoked assailant may receive no sentence of condemnation. Yet such a death must primarily be treated as a violent one, for the true character of the deed can be determined by judicial inquiry alone, and exoneration is attained only with the verdict which concludes the inquest. On the other hand, death by violence cannot be held to include such human agency as that, for instance, which in the form of parental indiscretion has contributed so freely to the mortality of infants. Neither can it mean those deaths which, also traced to a similar origin through what some one might have done but has failed to do in a preventive sense, are often sudden, always premature, accidental as we call them. The child who, for want of attention, is allowed to be drowned in a cistern or scalded to death in a vessel of hot water; the boy who in his carelessness falls from a tree and breaks his neck; the laborer who in perfect health and in pursuit of his daily work receives a heavy blow upon the abdomen, and three days later suddenly passes into a collapse from which he never rallies; the man of business who with

[1] The *italics* form no part of the original law.

hasty and unguarded steps collides with a post in the street and sustains injuries which are ultimately fatal; the victim of melancholy who wanders from home and is lost, and whose remains are found months afterwards with everything untouched except by the process of decay; those who perish by the unmistakable consequences of great natural commotions, such as thunder-storms and tornadoes; not one of these furnishes an example of death by violence in the medical examiner sense; no one of them dies by the method provided in the easy and uninterrupted order of nature; but on the other hand they do not die through an unlawful course of action on the part of any person.

"Supposed to have come to their death by violence." The word "supposed" imparts a degree of elasticity to the section, and without being intended to exclude those cases which derive a known character from obvious violence, enables it to cover a field the contents of which, as being unexplored, would otherwise be uncertain; and in which either the rights of good personal reputation or the demands of justice require that doubts should be replaced with facts. The term in question seems, at first sight, to be a vague one; it implies a mental process, but carries no reference to the conditions which shall render that process a sound and valid one. We must believe that the word is intended to mean the average opinion of intelligent minds whose conclusions, unmixed with the elements of credulity and timidity, represent the preponderance of well-considered testimony. In addition to this, violence may reasonably be "supposed" in those cases which, though not presenting *primâ facie* a suspicious aspect, cannot be proved by a very large probability to fall within the range of the operation of the natural causes of death. Whenever violence is not self-evident but only supposed, it is the duty of the medical examiner, before taking any action, to assure himself that the theory of illegal force commands a plausible support. His position is not a judicial one, yet his decisions may be final. He must judge of the applicability of the law to the case in hand. He must exercise that discretion which takes precedence of learning in the enumeration of qualities which determine the selection of candidates for office. Thus will he aid in establishing those principles upon which must be based every rule of official action, and in teaching the public to understand and accept those distinctions which are of fundamental importance, and which cannot be neglected without endangering his own integrity and dignity, and doing injury to the cause of law and order.

To the rule laid down I have in practice made an exception when a notice has been sent by a magistrate or municipal officer of high grade. I have then entered upon a medical examination without preliminary questions, and it is a curious fact that in all such instances I have found myself dealing with a kind of inverted cone, so that the further down the investigation proceeded the nearer it has come to nothing.

"Upon the view of the dead bodies of such persons only as are supposed" etc. The word "only" is here used in a strong restrictive sense, and contains the prohibition which limits the official competence and jurisdiction of the medical examiner. Unless there be a supposition of violence his commission confers upon him no authority and he is powerless.

In deciding what is the significance of the word "persons," I shall take the

liberty of referring you to an instructive paper,[1] written in answer to the question "What constitutes the dead body of a person?" and presented to this Society at the February meeting. The conclusions to which the writer came, after careful study and consultation, interest us now only so far as they relate to what of humanity is not included in the definition of "persons," as that term is understood and accepted by those who interpret law, and explain the intent of its equivocal portions. According to the indisputable authorities whom he quotes, judicial voices all agree in the declaration that a child is not born until it is entirely extruded from the maternal body, and that, although it may have breathed at some point in the parturient passage, if it be still at the instant of complete expulsion it has never become a person; and, therefore, cannot have been the subject of such violence as the medical examiner is qualified to recognize and certify to. No child known to be dead-born can be inspected in the sense of viewing the dead body of a person. But the question at once arises as to what course the medical examiner shall pursue in the event of the discovery, through the improper disposition of the body of a child born prematurely or at term, respecting which no information can be obtained. For a portion of them, Medical Examiner Holt lays down the following rule: "It would, perhaps, only be safe to conclude that all fœtuses born in the first half of pregnancy cannot live for any period, and the body of such an one cannot be considered the dead body of a person within the meaning of the law."

According to Caspar the maximum length of a fœtus at the end of the twentieth week of utero-gestation is twenty-eight centimetres. The application of a metric measure will determine with sufficient accuracy whether in a particular instance the medical examiner is dealing with a person or a thing. In other words he must decline to view a fœtal body unless it be more than twenty-eight centimetres long.

It appears from the report of the Executive Board for 1879[2] that in thirty-eight per cent. of all the views held the cause of death was found to be a natural one. Where three succumbed to violence, two yielded to nature. Can it be that in so large a proportion of the cases there was so much obscurity and mystery as to justly excite a suspicion of unlawful agency? Is it not possible that the office of medical examiner, like the drug last added to the materia medica, has been perverted through its application to conditions for which it was never intended? If this mistake has been committed, there was during the first few months that followed his institution an apology for it in the deficient condition of our statutes. An act[3] of the legislature of 1878 is the first

[1] Boston Medical and Surgical Journal, vol. ciii., p. 200. Society's Transactions, Vol. i., No. 3, p. 154.

[2] Boston Medical and Surgical Journal, vol. ciii., p. 265. Society's Transactions, Vol.i., No. 3, p. 175.

[3] Acts of 1878, Chapter 174. Sect. 1. No human body shall be buried, or removed from any city or town, until a proper certificate has been given by the clerk or local registrar of statistics to the undertaker or sexton, or person performing the burial, or removing the body. This certificate shall state that the facts required by chapter twenty-one of the General Statutes have been returned and recorded; and no clerk or local registrar shall give such certificate or burial permit until the certificate of the cause of death has been obtained from the physician, if any, in attendance at the last sickness of the deceased, and placed in the hands of said clerk or local reg-

that has ever authorized any one to certify to the cause of death whenever there has been no medical attendant during the last illness. Having made a general provision, it excepts cases of violence, and refers them to the medical examiner for certification. It thereby intimates that the simple fact that a man has died without medical supervision is not a sufficient reason for demanding a view; that it does not require or even permit the medical examiner to hold one.

"But nothing herein shall prevent any medical examiner from acting as such in any part of his county." This provision forms the concluding portion of the sixth section of the law to which we owe our official being. It is simply a negation, and conveys the idea that the medical examiner has full legal liberty to exercise his office throughout his county irrespective of the district lines originally established by commissioners. Without violating any statute a physician may render professional service to every patient who seeks it, yet there is a rule of etiquette, dictated by the sentiments of honor, justice, and propriety, not to speak of the less worthy consideration of self-protection, which restrains the average medical man, and admonishes him not to interfere in work already assigned to another. This principle should guide the medical examiner in his conduct towards official neighbors. Human nature is tenacious of its lawful possessions, it is jealous and intolerant of seeming intrusion. Provoke collision and coöperation is at an end. The success of this new system will not attain the highest possible degree unless its essential instruments act in cordial harmony. We can give no better proof of our devotion to the cause which we have espoused, and to which the acceptance of our commissions has committed us, than by cultivating and maintaining among ourselves relations, not simply of mutual good-will and confidence, but of active friendship. We should adopt a policy which is rendered safe and simple by the exclusion of all doubts and questions as to propriety. Therefore I hold the opinion that a medical examiner should decline to hold a view outside of the district for which he has been appointed unless the medical examiner whose district he enters either requests to be relieved from duty in a particular instance, or is so situated that his services connot be obtained within a period of time which is reasonable when considered with reference to the necessities of a given case.

Practice is the acknowledged route to perfection, and the novitiate is terminated only by the exercise and action which constitute experience, and confer new ability. For his training and instruction, for the gratification of that sense which appreciates and enjoys the curious and the interesting, the medical examiner needs all the opportunity and all the material which his district can

istrar: *provided*, that in those cities and towns where local boards of health have been established, the certificate of the cause of death shall be approved by such board before a permit to bury is given by the registrar or clerk. Upon application, the chairman of the local board of health or any physician employed by any city or town for such purpose, shall sign the certificate of the cause of death to the best of his knowledge and belief, if there has been no physician in attendance. He shall also sign such certificate, upon application, in case of death by dangerous contagious disease, or in any other event when the certificate of the attending physician cannot for good and sufficient reasons be early enough obtained. In case of death by violence, the medical examiner attending shall furnish the requisite medical certificate. Any person violating the provisions of this section shall be punished by a fine not exceeding twenty-five dollars.

possibly furnish. He is defrauded and retarded in his official growth whenever that to which he alone has a claim is converted to the use and advantage of another.

The medical examiner, required to be "learned in the science of medicine," must be a physician, and is under a double obligation to be of good repute. Even if his ideas of duty are less severe than those which have found expression here, his conduct should be regulated by those principles, a strict adherence to which has made the name of medicine so suggestive of intelligence, moral worth, and public spirit.

IGNORANCE AS A LEGAL EXCUSE FOR MALPRACTICE.[1]

BY A. E. PILLSBURY, ESQ.,
Associate Member.

It is not proposed to attempt in this brief paper an exhaustive examination of the subject indicated in the title, but only to glance at these interesting questions: —

I. How far can the ignorance of the physician be relied on in avoidance of criminal or civil liability for medical malpractice?

II. Does the law recognize any distinction, in respect of this liability, between different classes of practitioners?

A prosecution for malpractice, criminal or civil, ordinarily arises out of an offense of omission rather than commission; that is to say, out of the failure of the physician to apply due knowledge, skill, or diligence in his professional service. For positive misconduct, unwarranted by any claim or pretense of proper medical treatment, a physician undoubtedly may be liable to prosecution, as for assault or various kindred offenses, according to the facts. But with such cases, happily of rare occurrence, we have at present nothing to do. They fall into their proper divisions in the classification of the criminal law, and are not to be considered merely as cases of medical malpractice.

In England the extent of criminal liability for malpractice is settled by a long course of decisions.[2] It is there held that any person, learned or unlearned, who undertakes to deal with the life or health of another, is liable for manslaughter if the death of the patient results from his failure to use reasonable skill and diligence in his treatment. It seems, also, that he is there liable criminally, as for misdemeanor, for any injury to the patient caused by his default, though not resulting in loss of life.[3] It is true that a criminal intent is an essential element of all criminal offenses, but this intent may be inferred from the circumstances of the case; and the English courts will draw this inference, or allow it to be drawn by the jury, from evidence of reckless or grossly ignorant maltreatment, endangering health or life, without proof of any actual purpose of the accused to do harm to his patient.

In this Commonwealth a different rule prevails, and although the leading Massachusetts case has been directly followed in but few reported cases in other States, it is believed to have been generally acquiesced in, and to express a doctrine which is or is likely to be generally adopted in this country.[4]

[1] Read at the February meeting, 1881.
[2] See the English cases collated in 1 Leading Crim. Cases (Bennett), 56.
[3] 1 Bishop Criminal Law, 558.
[4] Commonwealth *v.* Thomson, 6 Mass. Reports, 134.

Samuel Thomson, whose name came to be bestowed upon the root and herb "school" of practitioners, was indicted in Essex in 1809 for the murder of Ezra Lovett, Jr., by giving him, on the ninth day of January, a poison called lobelia, of which he died the next day. The evidence showed that Thomson announced himself as a physician, and professed an ability to cure all fevers by means of his peculiar medicines, to which he gave various grotesque names not to be found in the Pharmacopœia.[1] He was called as a physician to attend Lovett, who was suffering from a cold, and subjected him for nine days to a course of sweats, emetics, and purgatives, which at the end of that period resulted in violent convulsions, collapse, and death. The court (Chief Justice Parsons and Justices Sewall and Parker) observed that the prisoner's ignorance was very apparent, and that it did not seem to admit of any reasonable doubt that the deceased lost his life by the prisoner's unskillful treatment; but that there was no evidence of express malice, nor that the prisoner was regardless of his social duty and bent on mischief, from which, if proved, malice might be inferred; and therefore held that he could not be convicted of murder. The prosecuting officer thereupon urged that the prisoner was guilty of manslaughter, in rashly and presumptuously administering to the deceased a deleterious medicine, which in his hands, by reason of his gross ignorance, became a deadly poison. But the court unanimously held that if the prisoner, notwithstanding his ignorance, acted with an honest intention and expectation of curing the deceased by his treatment, he was not guilty of manslaughter, although death was the consequence, unless, however ignorant of medical science in general, he had such knowledge of the dangerous character of his remedy that the jury might reasonably presume its administration to have been the effect of obstinate and willful rashness, and not of an honest intention and expectation to cure. There being no evidence sufficient, in the opinion of the court, to support the latter theory, Thomson was acquitted.

In the light of this case it appears that one who deals with the sick cannot here be held to criminal liability except in case of wanton or reckless maltreatment, accompanied by knowledge of the probable consequences. Ignorance, however gross, exculpates him, if that alone occasions his default: not because ignorance is morally a justification or excuse of his conduct, but because it excludes the malice which is an essential ingredient of a crime. There is nothing in the case to show that the court made or admitted any distinction, in the application of the doctrine, between the learned and the unlearned, or between those who hold themselves out and publicly practice as physicians and those who make no profession of the art and no claim to the learning and skill required in its exercise. Thomson, to be sure, held himself out as a physician, and was shown to have commonly practiced as such, but no reason appears why the same rule should not have been applied to him had Lovett been the only patient he ever attempted to treat. Indeed, the reason of the rule applies with greater force to a person who undertakes to act as a physician only on a single occasion, and so far as they adopt it at all the courts will probably extend it alike to all persons employed for medical service, under whatever circumstances.

[1] One he called "well-my-gristle," another "ram-cats." It is not supposed that the profession will be able to identify them by this description.

It would be useless to speculate upon the reasons which moved the court in Thomson's case to depart from the current of English authority. A sufficient reason, perhaps, is in the fact that upon sound and familiar principles of the law of homicide the decision seems to be a logical and necessary result from the circumstances shown in evidence. It is further countenanced by a *dictum* of Lord Chief Justice Hale, apparently founded on an obscure case in the Year-books, which the Massachusetts court cited with approval, but which has not been followed in the later English cases, that if a physician, whether licensed or not, give a person a potion without intent to do him bodily harm but to cure or prevent disease, and death results, it is no homicide. "I hold their opinion to be erroneous," adds the Lord Chief Justice, "that think if he be no licensed chirurgeon or physician that occasioneth this mischance that then it is felony, for physic and salves were before licensed physicians and chirurgeons; and therefore if they be not licensed according to the statute they are subject to the penalties in the statute; but God forbid that any mischance of this kind should make any person not licensed guilty of murder or manslaughter."[1] This view of the subject, characteristic of Sir Matthew Hale, though exceptional in his time and country, is more nearly conformable to general principles than the doctrine of the later cases. The existence of the English rule is probably due to the fact that it had become firmly established by a course of decisions before the humanitarian influences of modern times had begun to moderate the ancient rigor of the criminal law.

To educated physicians the American rule may appear to involve an unjust discrimination against themselves. Ignorance being held to excuse its own consequences, the more ignorant the practitioner the greater, apparently, his chance of escape; while the casual mistake or misfortune of the qualified physician is more likely to bring punishment upon him from the very fact of his education and the consequent increased difficulty of establishing to the satisfaction of the jury the theory of ignorance. But the rule of law applies with impartial benevolence to all, and the discrimination, if any, arises out of the facts. The law cannot be reproached that

> — "where ignorance is bliss
> 'T is folly to be wise."

The extent of civil liability for malpractice, in respect of the persons against whom, and the circumstances under which, it arises, is less clearly defined in the books. The foundation of this liability is in the rule that he who offers his services to the public for employment in a special capacity is bound to possess and exercise a reasonable degree of the learning and skill ordinarily possessed by those who follow the same vocation in the same locality, and to use reasonable care and diligence in its application.[2] This rule is established in all countries where the common law prevails, and it affects all who profess any art requiring special skill or training. Professional persons are not held to insure the success of their efforts, nor to exercise the highest or even a high degree of skill; but they must be of average ability and diligence. Failing in this, they are answerable for resulting injuries. The principal issue of fact

[1] 1 Hale's Pleas of the Crown, 429.

[2] Small *v.* Howard, 128 Mass. Reports, 131, and cases there cited.

in actions for malpractice usually is whether the defendant has fulfilled these requirements. Under this rule it is obviously impossible for the ordinary physician to avoid liability if he fails in reasonable skill or care. Whether he be schooled or unschooled, "regular" or irregular, is immaterial. An action for malpractice may be maintained against him even if he be forbidden by express statute to practice medicine.[1] If he offers himself to the community as a common practitioner he is held to guarantee his reasonable fitness for the business within the limits stated. The public profession of his calling forbids him to plead ignorance. He has thereby led the public to believe that he is reasonably well equipped for his work, and all who employ him have a right to rely upon his own representations.

But with reference to a class which hangs upon the outer verge of the medical profession, the inquiry is more difficult. There are in most communities, especially in great cities, numbers of persons — styling themselves clairvoyants, mesmerists, seers, *et id omne genus* — who do not profess to be physicians, who neither have nor pretend to have any professional knowledge or training, nor any scientific qualifications of whatever character for medical practice, who yet are constantly resorted to by multitudes of people for the treatment of disease. Beyond this, it occasionally happens that a person of another vocation, entirely unaccustomed to deal with the sick, is called to stand in the physician's place. It is said that a case of this character, in which a woman in labor lost her life under the hands of a shoemaker, acting for the nonce as accoucheur, is of recent occurrence in this city. Whether such persons can be held to civil liability for the consequences of their treatment, whatsoever they may be, must be considered still an open question. A hurried examination of the reports fails to disclose any direct adjudication of the point. Some light is reflected upon it from the circumstance that in many of the published cases the courts seem to rest upon the defendant's public offer of his services as a material element in the foundation of the action. The logical process which leads to a judgment against a physician for malpractice, when ignorance is relied on as an excuse, runs thus: (1) The plaintiff has been injured by the negligence or unskillfulness of the defendant; (2) the defendant says that he acted in good faith, and was ignorant of the patient's condition or the character of the remedy prescribed, etc.; (3) but he shall not now be heard to say he is ignorant, since he professed skill; (4) therefore he shall make good his default in damages. Obviously this argument does not apply to one who makes no profession of skill, nor of anything else except that he is a "clairvoyant" or what not. The common and public practitioner of medicine has undertaken to exercise skill, but this man has undertaken nothing save, perhaps, to do his best under the circumstances. If he does this, it is difficult to see how he can be held answerable for the consequences.

Another argument against his liability may possibly be drawn from the analogy between the action for malpractice and the ordinary action for negligence. The former rests upon the rule already stated, that he who professes especial skill must exercise it; the latter upon the rule or principle that every

[1] Musser's Executor *v.* Chase, 29 Ohio State Reports, 577.

person shall so conduct himself as not to injure others. Between these rules there is a close relation ; indeed, there is no essential difference between them, save that one is adapted only to particular cases, while the other is of general application to all the ordinary affairs of life. Ultimate analysis might show that the action for malpractice, unless founded in contract, rests alone upon the simple rule against negligence, modified to meet the special circumstances of the case. The essential elements of a cause of action for negligence are: (1) an injury to the plaintiff (2) resulting from the negligence of the defendant, (3) to which no negligence of the plaintiff contributed. If the third of these elements is wanting, that is to say, if the plaintiff has been guilty of any neglect or want of due care, to which the injury is in any material part attributable, he cannot maintain his action. The law will not hold one liable for an injury to another whose own default contributes to it, nor will it attempt to apportion the blame between them. Such an injury must lie where it falls. This principle of contributory negligence is constantly applied in actions of malpractice, with the result that the physician is not legally responsible for injuries attributable in any degree to the fault of the patient as an originating cause.[1] And the application of the principle to the case now supposed, of an action against an unskilled person for an injury done in a case which he has not professed himself competent to treat, seems to reënforce the argument against his liability, since it lays upon the plaintiff the disability which results from his own failure to exercise due care. If he calls an ordinary physician, relying, as he has a right to rely, upon his public profession of skill, and following his directions accordingly, no want of care can be imputed to him. But if he voluntarily chooses for the performance of a difficult and perilous task a person who neither has nor claims to have any special fitness for it, it is no hardship if he is left to bear the consequences of his own imprudence. In this conclusion the medical profession will probably concur with cheerful unanimity.

This latter branch of the subject still lies largely in the region of conjecture, and these suggestions are not offered with confidence as a statement of the law, but as having a possible bearing upon the determination of a question which has, fortunately, only an indirect interest for reputable physicians.

[1] Hibbard *v.* Thompson, 109 Mass. Reports, 286.

CONDITIONS AND CIRCUMSTANCES WHICH SHOULD INDUCE THE MEDICAL EXAMINER TO EMPLOY A CHEMIST.[1]

BY MEDICAL EXAMINER E. P. MILLER, M. D.

THE subject which I have chosen does not permit any original investigation or experiment, nor does it even allow a presentation and discussion of the opinions of authorities, for I have been entirely unable to find anything in books bearing directly upon this question. I shall only attempt, therefore, to call attention to the importance of the subject and to give my own idea of the proper method of proceeding in order to decide correctly, as individual cases arise, the question whether or not to employ a chemist. For it is manifestly impossible to create a set of rules by mechanically following which the medical examiner can be sure of a correct decision. No two cases of suspected poisoning are exactly alike in history, symptoms, and pathology. After all is said, nothing will be found as a substitute for the medical examiner's own judgment and discretion.

Somewhat over a year ago I was placed in what I felt to be a very difficult and embarrassing position. A lady well known in a small city had died under circumstances which suggested poisoning, and I had decided to make an autopsy. The illness had been short, but the symptoms gave no clew as to what poison, if any, had been administered. The main reason for investigating the case was the fact that, from the history, no satisfactory diagnosis could be made, while it was known, also, that two other deaths had occurred in the same family within a short time. Nobody was ready to believe that the lady would destroy herself, nor had any one been about her who seemed capable of doing her any harm. There seemed, however, to be sufficient mystery about the case to demand an autopsy, and I decided to perform it. By the most careful inquiry I could form no opinion in advance as to what pathological appearances I might find, and not having the confidence which years of varied experience must give, I approached the work with considerable hesitation and anxiety. I was afraid, on the one hand, that the death was due to natural causes, the evidence of which might escape me; on the other, I was anxious not to return as a natural death one really due to poison, and so, perhaps, permit the escape of a criminal. At the autopsy no sign of disease could be found, but there was unmistakable evidence of poisoning, and the chemical analysis discovered a large amount of arsenic. The cause of death was thus made plain; and, fortunately for my peace of mind, I had done the proper

[1] Read at the October meeting, 1880.

thing in employing a chemist. A careful man will, and I think all should, always undertake the autopsy in such cases with a certain amount of fear. His mind should be perfectly unbiassed; he should not be determined in advance whether to find evidence of poison or of natural death. The one thought should be to find everything pathological about the body, whether it points to disease or to poisoning, as when a case comes to trial it is found by the medical examiner that every sign of disease becomes of the greatest importance, and that he must be prepared to testify, not only that the death could have resulted from poison, but also that it could not have resulted from disease. To be sure, this is exactly the work for which the medical examiner is supposed to be qualified and prepared. Yet when we consider the results which may follow a mistake in either direction we must agree that the decision to employ, or not to employ, a chemist should be reached only after the most careful consideration of all the evidence in the case. It may be said that the whole matter is very simple, and that we should employ a chemist whenever we cannot satisfy ourselves, by an autopsy, of the cause of death. While this may be true to a certain extent, yet there are reasons for not employing a chemist unnecessarily. For instance, the mere fact that a chemist is employed may cause irreparable damage to the reputation of an innocent person. In the case above alluded to, in spite of great precaution, it became known that a chemist had been consulted, and suspicion immediately fastened upon a relative of the deceased who had previously borne a good character. Again, in one county at least, the commissioners constitute themselves the judges of all a medical examiner's acts; they reserve to themselves the right to pay bills or not, according as they think them necessarily contracted. From the mistake of not consulting a chemist when poison has been given the very serious result might be the escape of a murderer. But the whole reason for the existence of the medical examiner is the protection of society by detecting crime. When a poisoning case has once come into the hands of the law the chance that the medical examiner may not consider the evidence sufficient to warrant a chemical analysis affords the criminal his first loophole for escape. If murderers are to go free it should be through the lawyers rather than through medical men.

Perhaps of secondary importance is any loss of professional reputation which the medical examiner may suffer. This would certainly follow a wrong decision if, by any chance, his mistake should be discovered subsequently, or if at the time he could not satisfy the public mind.

In connection with the escape of criminals through an oversight of the medical examiner, I should like to remark that a very interesting question for speculation is whether it is possible that murders are being committed about us and remaining undetected or even unsuspected. From its very nature the question cannot be answered positively. Whatever may be true of the past the number of such murders ought certainly to diminish each year in civilized communities. According to the opinion of Taylor, expressed in 1873, such murders are (or were) very possible in England under the coroner system. For he says that in his opinion that system "affords no certainty for the detection of crime; it affords no protection to those who are wrongly charged

with crime; and, lastly, it in some cases screens a criminal by a verdict based upon an imperfect inquiry, in which the important medical facts are either not understood or are misinterpreted by the jury." The number of exhumations suggests the possibility of secret murder. Taylor says, again, that in thirty years' practice, fifteen cases of exhumation were referred to him in which the death was proved to have resulted from poison. In some of the cases an inquest had been held. I have in mind a case occurring in this State in which a body was exhumed after fourteen years and arsenic found. We trust that the medical examiner system is better calculated to detect crime than its predecessor, yet it seems possible that there are murders unsuspected even by the friends and attendants of the deceased, which, of course, do not come into the hands of the medical examiner at all. If acute poisoning is usually detected, may it not be true that chronic poisoning frequently is not?

These considerations may convey some idea of the importance of our subject. The investigation of a case of suspected poisoning seems to me the most delicate and difficult work the medical examiner is called upon to do. Not the least difficult of the many questions arising is whether or not to employ a chemist. The law under which we work affords little help, as it simply says: "The medical examiner may, if he deems it necessary, call a chemist to aid in the examination of the body or of substances supposed to have caused or contributed to the death." The evidence to be used in deciding this question of necessity may be discussed under two heads, as it comes from two entirely different sources: —

(1.) Evidence from the history of the case, including symptoms, and (2) evidence derived from the autopsy.

Evidence of either class may alone be sufficient to decide the question. Thus, in the first place, it is sometimes proper to decide before beginning the autopsy that a chemist should be employed. The cases in which, for the purpose of having a chemical examination, a body is exhumed, perhaps years after death, when the post-mortem appearances can have no diagnostic value, suggest themselves at once as examples. The autopsy in the case above alluded to was immediately followed by two others. Within the three weeks previous to the death of this lady, her father and mother had both died after short illnesses. No positive diagnosis had been made by the attending physician, and there had been in each case some symptoms which might be attributed to a poison. Consequently the bodies were disinterred, and though a careful autopsy was made in each case I had previously determined to have a chemical analysis, whatever the autopsies might disclose. This decision seemed justifiable under all the circumstances and considering the unanimity of public opinion. For, on the discovery of arsenic in the body of the daughter, the public mind decided at once that the father and mother must have been poisoned also. At least, there was a universal demand for an investigation. Here it seems proper to say a word concerning this public sentiment, as the medical examiner may at times very plainly feel its force. Perhaps the chances are that in any given case the opinions of the public and those of the medical examiner will agree. When they do not I think great respect should be given to public opinion, and that the medical examiner may be influenced somewhat by

it, unless he is absolutely sure of the ground on which he stands, and unless individuals are going to suffer manifest and great injustice. At all events it is easy to imagine a very disagreeable state of affairs, and one especially uncomfortable for the medical examiner, when he sees his duty clearly in one direction and the public or a neighborhood thinks it sees it in another. Such cases require the greatest tact and judgment in their management, as the medical examiner, and even the law itself, may fall into disrepute.

Sometimes it is possible to base a decision to have an analysis on symptoms alone, regardless of the pathology and the moral history of the case. Christison contends that no disease can successfully mimic the effects to which strychnia and hydrocyanic acid give rise. Taylor once concluded from the symptoms that strychnia had been given, though he had failed to find it. If symptoms are ever proof of the presence of poison they must still oftener be characteristic enough to demand an analysis. The conditions found in some cases of poisoning by strong irritants — the state of the lips and mouth, impending suffocation, coldness of surface, acid stains on bedclothes — should lead to a thorough analysis.

Thus we see the nature of the evidence from which the medical examiner may determine to employ a chemist before the autopsy. Just what and how many suspicious acts on the part of persons accused, just what symptoms and how characteristic, just how strong and plainly expressed a public demand are necessary, it is impossible to state in advance. This is where the skill and discretion of the medical examiner are displayed, and each case must be treated as it arises.

We now come to a consideration of the autopsy, and, for the moment, may suppose ourselves dealing with a body of whose history nothing is known. What conditions as found post mortem should lead to the employment of a chemist? A complete discussion of this question would involve a statement of the pathology of all poisons and a comparison with the pathology of all diseases, which would involve many long details of which every medical examiner is supposed to have obtained sufficient knowledge in the course of ordinary study and practice. I shall, therefore, offer only a few general considerations, and mention some appearances which should lead to an analysis regardless of the history.

Poisons may be divided into two great classes, irritant and neurotic. On a general survey of the post-mortem lesions as detailed by authorities one is struck by the frequent absence of characteristic effects. The whole class of neurotic poisons as a rule do not leave any well-marked appearances in the body, and this class includes such well-known poisons as opium, strychnia, belladonna, aconite, and digitalis. Both irritants and neurotics may destroy life without leaving any appreciable changes in the body. "Evidence derived from post-mortem appearances can merely be more or less suggestive. Only a few poisonous substances make such decided impressions upon the living tissues as to warrant even a very strong presumption of their presence." [1] In case of all neurotic poisons it seems safe to say that we cannot expect to find at the autopsy sufficient positive evidence to warrant even a decision as to the necessity

[1] Reese on Poisons.

of a chemical analysis, to say nothing of finding a cause of death. Here should be excepted, however, autopsies where the odor of such poisons as alcohol, chloroform, and hydrocyanic acid can unmistakably be detected; these odors are sufficient to call for an analysis, even if they are not positive proof of the presence of the poison. But the absence of the odor is no proof of the absence of the poison.

Irritant poisons are more likely to leave post-mortem signs, and the lesions in some cases are more characteristic. "They act chiefly on the stomach and intestines, which they irritate, inflame, and corrode. We may likewise meet with all the consequences of inflammation, such as redness, softening, thickening, ulceration, and perforation."[1] But each of these conditions may depend upon disease as well as upon the action of irritant poisons. There are various points of difference between these appearances when produced by disease and similar appearances produced by poisons, yet it may be very difficult, if not impossible, to make the distinction without knowing the history of the case. I should consider any of these lesions, much more a combination of them, sufficient to demand an analysis, unless poisoning could be eliminated in some other way. As neurotic poisons may leave their odor, so irritants may cause very characteristic signs of their presence (not true pathological lesions), any of which should call for an analysis. Such are the white patches of arsenious acid sometimes found firmly attached to the mucous coat of the stomach, the peculiar slate-colored deposit said to have been seen in the stomach after poisoning by corrosive sublimate, and the remains of poisons themselves sometimes discovered by close inspection. Here, too, may be noted the preservative effect of arsenic.

This attempt to consider the nature and weight of the evidence furnished separately by the history, symptoms, and autopsy, may at least have suggested the importance in every medico-legal case of gaining evidence from every possible source. The history, or the autopsy, taken separately, is often entirely inconclusive, while the two together may be decisive.

Poisoning has been suspected in cases of death from various natural causes; for instance, peritonitis, intussusception, strangulated hernia, and more rarely rupture of the stomach or duodenum, rupture of the bile ducts, and rupture of the uterus. By combining the history and the autopsy in such cases it is often possible to declare that death could not have been caused by poison. The evidence from the autopsy can always be obtained unless decomposition prevents, while an exact and reliable history may easily be wanting. To be deprived of either class of evidence can only be considered a misfortune. Yet if all the obtainable evidence is duly weighed, if our reasoning is founded on facts and not on theory, we may expect to decide the question under consideration to the advantage both of the public and of ourselves in the vast majority of cases.

I trust that the somewhat desultory and unscientific character of this paper may be attributed partly to the nature of its subject, which hardly seems to admit a more precise and definite answer.

[1] Taylor's Manual of Medical Jurisprudence.

REPORT OF THE EXECUTIVE BOARD

ON THE

WORK OF THE MEDICAL EXAMINERS FOR THE YEAR 1880.

In behalf of the Executive Board of the Massachusetts Medico-Legal Society the following report is presented for the year ending December 31, 1880:

Of the fifty-five medical examiners who were members of this Society during the year forty-one have reported their work for 1880, either partially or in full, to the Corresponding Secretary. Complete returns were received from twenty-six medical examiners. One has returned special reports only, and fourteen have returned annual returns only. From the returns of forty-one medical examiners we compile the following statistics: —

Total number of views made during the year	935
Number of views followed by autopsies	229
Number of autopsies refused by authorities	1
Inquests held on above	197
Inquests at which medical examiners testified	123
Cases reported by medical examiner as probably resulting from "violence" in which no inquest was held	119
Deaths from natural causes	345
Deaths from railroad accidents	138
Deaths from other accidents	277
Deaths from suicide	113
Deaths from violence (the act of another)	104
Deaths directly or indirectly the result of intemperance	137
Prosecutions resulting	23
Convictions resulting in cases now finished	8

The relative proportion of views to autopsies and inquests during the past three and a half years has been as follows: —

	1877 (six months.)	1878.	1879.	1880.
Views	443	858	770	935
Autopsies	116=26+%	196=23+%	182=23+%	229=24+%
Inquests	90=22+%	172=20+%	151=20+%	197=21+%

The comparative statement of causes of death is as follows: —

	1877	1878	1879	1880
Natural causes	23%	39%	38%	35%
Railroad accidents	17%	14%	11%	14%
Other accidents	29%	25%	30%	28%
Suicide	16%	11%	16%	12%
Violence by another	11%	8%	7%	11%

For the purpose of minute analysis the same mode of classification is adopted as in 1879.

Deaths by accident, as compiled from special reports only, were returned as follows: —

Railroad injuries	67
Drowning	64
Fall	33
Falling bodies	11
Elevator accidents	5
Machinery accidents	5
Boiler explosions	12
Asphyxia by smoke	3
Asphyxia by food or vomitus in windpipe	2
Run over	8
Burns	4
Shooting	2
Explosion of nitro-glycerine	1
Blows on the head	2
Hanging	1
Fall from carriage	1
Poisoning by tartar emetic	2
Poisoning by arsenic	2
Poisoning by elixir of opium	1
Cause not stated	1
There were also by overlaying (infants)	3
Instrumental labor (infants)	4

Deaths by "violence" (the act of another) were as follows: —

By poison (arsenic)	2
By pistol-shot	3
By pistol-shot and strangulation	1
By blows on the head	1
By criminal abortion	1
By cause unknown	2
By infanticide	7

Suicidal deaths: —

By hanging	22
By shooting	10
By drowning	7
By cutting throat	2
By leaping from a window	1
By leaping upon railroad	1
By Poison	12
Morphia or laudanum	5
Paris green	3
Aqua ammoniæ	1
Prussic acid	1
Cyanide of potassium	1

Deaths from natural causes: —

Heart disease	58
Apoplexy	22
Alcoholism	20
Pneumonia	10
Phthisis and hæmoptysis	11
Pulmonary congestion	4

Œdema of lungs	3
Bronchitis	2
Nephritis	4
Aneurism	2
Peritonitis	3
Convulsions	3
Epilepsy	2
Old age, with exposure or destitution	7
Cholera morbus	2
Puerperal fever	2
Post-partum hæmorrhage	1
Embolism, acute rheumatism, insanity, scarlatina, hæmorrhage into pancreas, congestion of brain, disease of spleen, syncope, paralysis, measles, neglect, and debility, each	1
Skeleton found, cause of death unknown	1
Causes not stated or unknown	5

Infantile group from natural causes: —

Still-birth	16
Premature birth	13
Cholera infantum	7
Convulsions	5
Cyanosis	2
Marasmus	2
Exposure, hydrocephalus, bronchitis, defective development, and congenital malformation, each	1
Cause not stated	10

The Executive Board desire to call the attention of the members of the Society to this clause in the second section of the By-Laws: "Every member shall forward to the Corresponding Secretary a report, *as full and complete as possible*, of each case which shall receive his official attention." While many members fulfill this duty with conscientious exactness, giving to the Society reports of their work, which are models of medico-legal excellence, there are also many who are content with furnishing but a single line of detail. While reports of the latter description may possess a certain value as contributions to the statistical tables of the Society's Transactions, it is needless to add that they contribute little to the general fund of medico-legal science.

Our reports are annually increasing in value, and have already been consulted by medical gentlemen in search of material for illustration of medico-legal subjects.

During the year the work of filing and indexing the reports of cases has been completed up to the beginning of the present year, the result of the work making nine volumes containing detailed reports of 1602 cases.

The last year being the national census year, we are enabled to present an estimate of the whole number of medical examinations throughout the commonwealth for a single year. This is based upon the returns already made by medical examiners representing a majority of the population. The value of statistics is greatly enhanced as the numbers of population are increased from which such statistics are compiled. For example, in one small town of 700 inhabitants, there were three suicides in one year; it would be far from correct, however, to infer from this fact that there had been 7600 suicides in Massachusetts in a year. It is not safe to compile statistics on a basis of 1000,

or 10,000, or even 100,000 people. We may, however, form estimates from a million inhabitants with a tolerable assurance of reaching a uniform result under like conditions. Massachusetts contained in 1880 a population of 1,783,086. For the same year forty-one medical examiners rendered reports to this Society, representing districts containing a population of 1,312,031, leaving other districts containing 471,055 inhabitants from which no reports were returned. In order to present an approximate estimate which shall be as nearly correct as possible, it must be remembered that the medical examiners who have reported their annual work represent a dense population, mainly inhabiting the cities and large towns of the Commonwealth. The remainder who have not reported, with but few exceptions, represent a sparse population. In the latter districts the ratio of sudden, violent, or suspicious deaths is less than that in the cities and large towns. No inflexible rule can, however, be stated. The various items enumerated in our annual reports are affected by the comparative density of population in a somewhat different ratio. Thus, the ratio of railroad accidents and other casualties is much greater in or near the cities and large towns where railroads converge and steam-boilers, factories, mills, and dram-shops abound. On the other hand, the ratio of suicides is affected in a much smaller degree by density of population. Upon careful examination of these and of minor causes, affecting the population of different districts, we find that an addition of about twenty per cent. should be made to the total number [1] of reported views followed by autopsy, of inquests held, of fatal railroad accidents, and of other fatal accidents ; and of ten per cent. to the total number of views, of deaths from natural causes, and of suicides as reported.

The following table represents the estimated returns from the whole State, and is probably not far from correct : [1] —

Estimated whole number of views made in all districts	1145
Estimated whole number of autopsies made in all districts	249
Estimated whole number of inquests	215
Estimated whole number of deaths from natural causes	422
Estimated whole number of railroad accidents	149
Estimated whole number of other accidents	301
Estimated whole number of suicides	138

FINANCIAL ASPECTS OF THE MEDICAL EXAMINER SYSTEM.

In compliance with a vote of the Society, the Executive Board have during the past year investigated the subject of comparative expense of the coroner and the medical examiner systems in Massachusetts.

While it is impossible to present an exact statement of the expenses under the old and the new laws, the results obtained from the replies of county treasurers are favorable in the aggregate to the medical examiner law of 1877.

Certain points in this investigation require explanation before presenting a

[1] See summary in first section of Report.

[2] In confirmation of two items in this estimate reference is made to the Thirty-Ninth Massachusetts Registration Report (1880), pages 85 and 87, where the deaths by railroad accident are reported as 146, and suicides 133.

tabular summary. The proceedings attendant upon an inquest are necessarily of a two-fold nature, medical and legal. Under the old law both offices were combined in one individual, the coroner first viewing the body in person, together with his jury, and then sitting in the character of a magistrate and hearing the evidence.

The bill of expense of this two-fold proceeding was also summed up in one paper, and the entire sum paid to the coroner, to be distributed by him to the various persons entitled to fees, including the jury, the witnesses, the constable, the scribe, the surgeon, the chemist, etc.

Unfortunately for this investigation, while it is an easy matter to obtain an exact statement of the medical examiners' expenses, each county treasurer having kept these as a separate item, on the other hand, the court expenses of inquests (consisting mainly of constable and witness fees) are in some counties mingled with the criminal expenses of the same courts in such a manner that it is impossible to separate them. We have, however, obtained from county officers an average estimate of the cost of inquests, and this is quite uniform for those counties which have not rendered a separate and exact return of this item. The average cost in those counties, with the exception of Suffolk, is about $14.50 for the *legal* part of an inquest; in Suffolk County the average cost of inquests in the courts under the new law has been only $7.26.

Under the present law the proceedings attendant upon an inquest are divided between the medical examiner and a district or municipal justice. Hence the bill of expenses is also naturally divided, the medical examiner rendering an account only of that portion of the work which is strictly his, and the clerk of the court or trial justice also rendering his portion of the expense upon a separate paper. This division of the expense is rendered doubly necessary by the fact, that, while under the old law an inquest usually followed quickly after the official view of the body (often within twenty-four hours, and almost invariably within a week), on the contrary, under the present law, a considerable delay is usual between the view or medical examination and the inquest, — often from one to six months elapses, — and the medical examiner's account may be sent in and settled before the inquest takes place.

For the purpose of convenience, the expenses of two periods of three years each under the old and the new laws are shown in our report. The two half years of 1877 (the new act took effect July 1, 1877) are not considered, since the introduction of that year would render liable a confusion of accounts in some county reports.

The period from January 1, 1874, to December 31, 1876, is selected under the old law, as being the nearest available period in point of time and extent of population; under the new law, the years 1878, 1879, and 1880 are selected as being the only three complete years for which accounts have yet been rendered.

The following table is necessarily somewhat incomplete. It shows the comparative expenses of the two periods selected as fully as possible from the replies received from all counties. The result is favorable to the medical examiner law of 1877, for the reasons which will be stated: —

Counties.	Population, 1880.	Amount paid for Coroner's Inquests and Views in 1874, '75, and '76.	Paid for Medcal Examiner's Fees in 1878, '79, and '80.	Paid for Inquests in the Courts in 1878, '79, and '80.
Barnstable	31,945	$912.38	$311.20	$178.84
Berkshire	69,049	1,384.00	675.23	297.25
Bristol	139,121	3,108.47	1,887.49	– –
Dukes	4,305	246.26	131.80	– –
Essex	244,640	6,263.86	3,457.94[1]	– –
Franklin	36,000	496.00	826.68	– –
Hampden	104,117	3,041.47	3,111.13	– –
Hampshire	47,235	1,772.79	790.60	– –
Middlesex	317,951	7,002.10	5,212.99	– –
Nantucket	8,726	32.90	52.21	– –
Norfolk	964,62	2,108 85	2,698.09	– –
Plymouth	74,024	894.20	551.70	169.55
Suffolk	387,626	28,828.63	20,276.26	1,620.26
Worcester	226,885	4,878.42	1,451.45	1,224.97
State [2]	– –	2,741.71	5,741.17	– –
Total	1,783,086	$63,712.04	$47,175.94	$3,490.87

The figures given in the first three columns of the foregoing table are matters of record, as are also those in the last column, so far as presented. In the case of those counties from which no answers could be obtained, to complete the record in the fourth column an estimate is given, based upon the reported work of medical examiners for the past three years, combined with the replies of county treasurers. It cannot be far from the truth. These estimated inquests number 265, and their aggregate cost, at $14.50 each (the average, as mentioned above, for counties other than Suffolk), was $3842.50. Adding this sum to the totals of the last two columns in the table, we have a grand total of $54,509.31 as the whole expense of inquests and medical examinations in Massachusetts, during the three years 1878, 1879, and 1880. This sum is much less than the total expense for similar service under the coroner laws during the three years 1874, 1875, and 1876, the difference in favor of the recent statute being $9202.73.

A favorable point to be noted in the foregoing tabular summary, is the difference in population of the two periods selected for comparison. Between the middle years of each period of three years (1875 and 1879) the State had gained over 100,000 inhabitants.[3] Had the population remained the same, the difference in absolute expense would have been considerably greater than is shown by the table.

The chief reason for the diminution in expense, appears to be the abolition of the coroner's jury. Under the old law, a jury of six men was requisite for every inquest, their fees being $1.25 each per day, and mileage. An inquest often continued for several days; a single day's pay for a jury was $8.22, but since an inquest often continued two or more days, the average pay of a coroner's jury may be safely stated as high as $12.

[1] Costs of inquests in the courts are included in this sum, but not separately reported.

[2] These amounts were paid from the State Treasury for inquests, medical examinations, etc., on the bodies of strangers having no known legal settlement in this Commonwealth.

[3] State census of 1875, 1,651,652. National census of 1880, 1,783,086.

As an illustration of this change in consequence of the abolition of the jury, we are permitted to give the following abstract of a statement, submitted by a medical examiner, who was also a coroner, and has kept an accurate account of all expenses under each régime.

Amount paid by county treasurer in all cases occurring in a district containing about 9500 people in 1874, 1875, and 1876, $296.57 ; of this sum, $86.10 was paid for jurors' fees.

Amount paid by county treasurer in same district for all cases, in 1878, 1879, and 1880 (population about 10,000), $238.75.

The amount of medico-legal work done in the latter period was somewhat greater than in the former.

Another reason for a lessening of expense is found in the diminution in the number of inquests, if we may judge from the returns of the only counties which have given a definite statement upon this point. In the counties of Plymouth, Norfolk, and Essex, in 1874, 1875, and 1876 there were 124 inquests. In 1878, 1879, and 1880 there were only 75 inquests in the same counties. The same general fact is true of other counties, although definite figures are not given. It would be safe, however, to estimate the decrease in the number of inquests, throughout the State, as at least thirty-three per cent. since the passage of the new law. The reasons for this change may be discovered in the appointment, to fill the offices formerly held by coroners, of men whose education necessarily fits them for the work which they are expected to perform. Under the old law, a man found dead, even without the least suspicion of violence, as in a simple case of heart disease, or apoplexy, would in all probability be reported to the village coroner, provided the most common hypostatic marks of post-mortem discoloration were noticed by some bystander, such marks being often interpreted by the popular mind as significant of a violent death. Hence the coroner sets in motion the cumbrous machinery of his office. In the first place he sends for a constable. The constable summons a jury. The witnesses come next, and last of all the nearest physician is summoned, whose evidence satisfies the assembly that the man died a natural death.

Under the working of the present law, the order of procedure is reversed. The medical officer first views the body, and in a case like that just referred to, simply reports it as a view, with a charge of $4.00 and mileage. If, however, he believes there is a reasonable suspicion of violence, as revealed by the evidence shown him from an external examination of the body, and upon personal inquiry of the necessary witnesses, and also by an autopsy if that be found requisite, the case is reported to the proper authorities for inquest.

Under the old law, so far as can be learned, the proportion of inquests to cases of all sorts (views and inquests) was at least as high as 40 per cent.

Under the statute of 1877, the proportion of inquests to views of all sorts has been not more than 22 per cent.

The number of autopsies in proportion to the population, has been somewhat increased since the abolition of the old statute, but by no means sufficiently to counterbalance the diminution in expense caused by the abolition of the jury. A reason for this increase is also found in the appointment of offi-

cers who have an intelligent appreciation of the prerequisities to a medical examination in cases of violent or suspicious death. Cases have occurred in this Commonwealth in former years, and occasionally occur in neighboring States, in which criminals go unpunished through the neglect of a coroner to order a thorough examination, before the usual post-mortem changes interfere with a correct interpretation of the lesions present at the time of death.

The tests to which the Medical Examiner Law of Massachusetts has been subjected during the past four years of its operation have thus far shown it to be less expensive, less liable to the perpetration of fraud, and more efficient than the Coroner Laws which it has superseded. We trust that its successful operation in Massachusetts will soon lead to its introduction throughout other States of the Union.

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WHAT CONSTITUTES A MEDICO-LEGAL AUTOPSY?[1]

BY MEDICAL EXAMINER S. D. PRESBREY, M. D.,
President of the Society.

At the trial of Thomas McMullen for the murder of his wife, Annie McMullen, held before the Supreme Judicial Court in Taunton, in April, 1882, the question of the completeness of the autopsy in that case was made an important element of the defense. For the clearer understanding of the matter, the principal points in the evidence bearing upon this question are here introduced.

Medical Examination of the Body of Annie McMullen, with facts learned on Personal Inquiry as to the Cause and Manner of Death, by Medical Examiner Dwelly, of Fall River. — At seven o'clock on the morning of July 25, 1881, I was informed by the police that Annie McMullen was lying dead at a house in the rear of 29 Canal Street. In company with the officer I immediately proceeded to the place. The body lay on a bed in a small room in the second story of the house. It was lying on the back across the bed, which was greatly disarranged. A pool of blood was on the cloth under her head, and blood was still slowly *exuding* from under the scalp from a wound in the side of the head. Her hair was matted and filled with blood, and several splinters of wood were entangled in it. The room had been closed till opened by the officer, and had a sickening odor and was filled with flies. Blood was spattered upon the walls, and soiled clothes, which had evidently been used in wiping the blood from the floor and walls, were lying about the room. I learned, on inquiry, that McMullen had on the day before (Sunday) beaten his wife, and that he had been in the habit of beating her. On finishing the view I ordered the body removed to the undertaking rooms of Waring Brothers. After having been authorized by Mayor Braley, and having requested the attendance of Drs. Brown and White as witnesses and assistants, I proceeded to make an autopsy at nine o'clock, A. M. (The body when found was still warm about the abdomen and chest where covered with the bedclothes, but the face and extremities were cold. The day was very close and warm.) The body was stripped of its clothing, and the sticks and splinters removed from the hair and carefully preserved.

COPY OF THE RECORD OF AUTOPSY.

The body of a woman about five feet three inches in height, of medium flesh, and estimated to weigh about one hundred and fifteen pounds. Rigor mortis not well established. Death was considered to have taken place within twelve hours preceding autopsy.

The face was much swollen and discolored. Both eyelids were greatly distended and

[1] Read at the Annual Meeting, June 13, 1882.

very dark in color from extravasated blood. The conjunctiva of the left eye was injected with blood. There was a wound in the upper lid of the left eye just under the brow and on the edge of the orbit of about one inch in length, extending through the integument. The head was extremely bruised upon the whole top and sides as far as the line of the ears, suggesting that it had been forcibly and repeatedly struck with some hard and blunt instrument. A wound through the scalp about an inch in length was found just above and behind the right ear, and upon the vertex another, one and a half inch in length, extending about half through the scalp. An extensive abrasion of the skin reached from the right brow and temple half way down the face. The backs of the hands and ulnar sides of the forearms were nearly covered with severe contusions and abrasions, and were very much discolored by extravasated blood. There were also several abrasions on the shoulders and on the chest at the top of the sternum. A severe contusion on the right side over the region of the liver measured seven inches in diameter. Both nates were bruised and discolored. Many other bruises and abrasions of less extent and severity were found on different parts of the body. All the above-named injuries were of recent origin.

Internal examination. On lifting the scalp there was found a large quantity of effused blood, covering the entire vertex and extending over the temples, filling completely the temporal muscles and the surrounding connective tissue. The scalp from the top and sides of the head was so swollen and filled with effused blood that it literally felt like a bag of jelly. There was no fracture of the skull, nor any internal appearance of injury to the brain or its coverings. The heart, lungs, and all the abdominal viscera were apparently healthy except the liver, upon the anterior surface of the right lobe of which were seen several small nodules. The right side of the heart was filled with coagulated blood. The stomach contained a very little fluid. Death resulted from shock, consequent upon the injuries to the head and other parts of the body.

Medical Examiner Dwelly testified in accordance with the record of the autopsy as given above, and that, in his opinion, death was caused by the shock of the repeated blows, no one of which might have been sufficient to cause death, but all of which together were the cause of shock which proved fatal. On cross-examination Dr. Dwelly stated that he made as complete an autopsy as is usual; that he examined the brain thoroughly; that he did not open the spinal canal; that the spinal cord is an organ; that he knew that injury to the spinal cord might produce instant death; and that after he had completed the autopsy he refused to allow Dr. Charles Terry to make an internal examination of the body.

(It is proper to state here that after the completion of the autopsy the counsel for McMullen made application to Dr. Dwelly to allow Dr. Terry to be present at the examination, not knowing that the work had been already done. As this was impossible, he then asked for the privilege of a second autopsy by Dr. Terry. This was refused, but it was agreed that Dr. Terry might view the body in the presence of the medical examiner and make such external examination as he desired.) Drs. Brown and White, who were the witnesses to the autopsy, substantiated the testimony of Dr. Dwelly. Mrs. Sullivan, and several other women living in the vicinity, testified to having heard the sound of blows with some hard, flat substance, many times repeated, and that with these sounds were mingled the cries of a woman.

Mr. Cummings, in opening the defense, used these words: "How good an autopsy was made by the government? We shall show you that it was incomplete. While the examiner looked in *three* places for the cause he neglected the *fourth*. He found the probable cause, but in cases like this we want to know what the actual cause was."

Thomas McMullen, the defendant, testified that he took a broom and hit his wife once or twice with it; that she went out in the evening for water; that he fell asleep, and awoke at four o'clock the next morning, and not seeing his wife got up and found her lying dead on the stairs; that he took her up and laid her on the bed. Cross-examined. Struck her and broke the broom-handle over her, and then used his hands. (The testimony regarding finding the body on the stairs was unsupported.)

Dr. Charles C. Terry, of Fall River, in his testimony mentioned the vital organs, and among them included the spinal cord. "The autopsy would not be complete without the examination of every vital organ. An examination of the spinal cord could not be made externally."

Dr. Dwelly, recalled, stated that he examined the brain and also the upper portion of the spinal cord; that there was no fracture of the base of the skull; that the right side of the heart being filled with coagulated blood was an indication of the manner of death (shock), but not an infallible one.

Dr. Terry, recalled. "I do not think a sufficient examination was made in this case to ascertain the cause of death. I asked permission of Dr. Dwelly to make an autopsy, but he refused to let me. I noticed that the neck was swollen and discolored, and that the head was limp or loose; it wobbled about; it attracted my attention as something unusual. The neck should have been examined. In my judgment not more than six hours had elapsed between her death and the time of the autopsy." Cross-examined. "In an autopsy, if I found the cause of death in one spot I should look no further. The opinion of a medical examiner is always open to dispute."

Dr. George L. Keene, of Providence, R. I., testified that an autopsy would not be complete unless all the vital organs were examined; that if in making an autopsy he found the cause of death at once he should go no further, unless at the request of friends or to satisfy himself.

Dr. John H. Mackie, of New Bedford, testified that when the cause of death had been found it was not necessary to push an autopsy beyond that point. In this case he considered that the cause had been satisfactorily found.

Medical Examiner Presbrey thought the autopsy was complete, in that it established the cause of death, and that there was no more necessity of opening the spinal canal in this case than there was of examining the stomach and liver for poisons.

Thomas McMullen was found guilty of "murder in the second degree."

As it is the aim of the medical examiner to establish the truth, and to forward the cause of the broadest justice, it is of the first importance that his work should be such as shall command universal respect. To his direction the State intrusts the first steps in every trial for murder, and the autopsy which he makes may become the foundation upon which the whole trial is to rest. To us as medical examiners, then, no question can be more vital than that involved in the above trial, and which I have chosen as the subject of this paper.

If we seek an answer to the question in the derivation of the word autopsy, we shall find, to our disappointment, that it literally means *personal inspection*, simply, but throws no light on the method or extent of such inspection.

It is evident from Chapter 200 of the Statutes of 1877 that a wide distinction should be drawn between a "view" and a "further examination" or autopsy, the former comprising an inquiry into "the cause and manner of the death," the latter a thorough and exhaustive examination of the body itself with the purpose of settling precisely the cause of death, if such be possible; for in no case can the two terms "view" and "autopsy" be considered synonymous, nor does the law specify any method of determining which shall be made, except to leave the question to the judgment of the examiner and the approval of the city or town officers. We must turn, then, for definition to usage, and to a consideration of the purpose and object of an autopsy.

Orth says, "Our object may be to ascertain the cause of death; in this case the examination must be thorough and methodical, otherwise an important point might be easily overlooked. It was formerly the custom to separate medico-legal from the so-called pathological autopsies, and in forensic cases to limit the examination to those changes which were immediately connected with the legal question at issue. But this was all wrong, for one can never know beforehand how important the morbid condition of any special organ may become during the course of the investigation, nor is one in a position to give a final and weighty opinion as to the fatal disease, the cause of death, or the condition of particular organs, unless each and every organ in its individual and associated capacity has been accurately studied and made out. For these reasons the new regulations for procedure in medico-legal cases in Prussia prescribe a careful and methodical examination and description of all parts of the body in their several relations, and at the present time a medico-legal is only distinguished from a pathological autopsy in that everything which may serve the ends of justice is treated with even greater accuracy and detail than is the case in an ordinary autopsy."

Virchow "drew particular attention to the necessity of insisting (in autopsies for medico-legal purposes as in everything else now) upon completeness of examination and exactness of method, both in the investigation and in note-taking, so that it might be decided, subsequently, though not in anticipation, whether there was any significance or importance in what was observed, or whether it was accidental and unessential." Again, "a not insignificant portion of the administration of the criminal law is entirely dependent upon a correct and objective examination on the part of the medical jurist. It would, I am sure, be a matter of no difficulty to collect a great number of examples in which the faulty performance of the autopsy has rendered obscure cases in themselves clear and simple, and has made unintelligible those which were at all ambiguous."

The advice of Woodman and Tidy is pertinent: "Let your post-mortem examination be a thorough one. Do not, for example, make so serious a mistake as to neglect the examination of the *head*, because the death was a sudden one, and you found *heart* disease. Death is sudden in some cases of cranial hæmorrhage, and remember apoplexy may coexist with, or be caused by, poisoning." And in cases of poisoning "note all pathological appearances, for you must endeavor to prove not merely that the deceased died from poison, but that death did not result from natural causes."

Reese, in a note in the last edition of Taylor, remarks, "In medico-legal cases involving the question of life and death, the examination of the body of the deceased cannot possibly be too thorough and exhaustive; the omission of any one organ is a radical defect," and cites two cases that occurred in this country in 1872, in which the incompleteness of the autopsies became serious defects in the evidence at the trial, the one from non-examination of the spinal cord, the other from omission to examine the kidneys and other important organs.

Taylor says that "the great art of counsel who defend persons charged with murder or manslaughter consists in endeavoring to discover what the medical examiner omitted to do."

Thus we find that usage, as established by the best authorities, demands nothing less than the most thorough, exhaustive and methodical examination of the body in medico-legal autopsies.

But it is, perhaps, desirable to study our subject more in detail. Section 8 of the Law of Medical Examiners requires that the examiner "shall make personal inquiry into the cause and manner of the death," and shall at the autopsy "carefully reduce to writing, or cause to be reduced to writing, every fact and circumstance tending to show the condition of the body, and the cause and manner of death." His first duty, then, is carefully to note the position and surroundings of the body when first found. To this investigation the circumstances of each individual case alone can set the limit. It is easy to imagine how facts so learned, apparently the most trivial, may prove to be of the first moment in the course of the trial; and though other officers of the law may also be expected to give attention to matters of this nature, it is none the less the duty of the medical officer.

We next come to the external examination. The facts to be learned under this division cannot be too carefully ascertained. They are often quite as weighty as those reached by section, and quite as likely to be appreciated by a jury. No simple survey of the surface as a whole should satisfy. The same exactness of method and thorough attention to detail should prevail here as in every other part of the work. After the marks of death itself have been noted, every region and each natural opening of the body should have a proper share of attention. The details of such an examination are most abundantly treated in Casper's Forensic Medicine.

There can be no question of the importance of the next division of the work, the internal examination, for too many are inclined to dwell upon this to the exclusion of the work mentioned above; hence I need call attention to no details, for any neglect here can only be attributed to inexcusable carelessness. My duty lies mainly in an attempt to define the limits of this work. All authorities are united in the opinion that under all circumstances the three great cavities, the head, the thorax, and the abdomen, should be opened and their contents minutely studied. As regards including in this list the spinal canal, authorities differ, but all again agree that not only the spinal cord but any and every part of the body should be examined, if there is reason to think that important information can be gained thereby.

Woodman and Tidy, under the heading How to Make a Post Mortem,

after describing the examination of the head, say, "Now proceed to the examination of the spinal cord and its membranes," thus including this in the regular order of work. Beck says, "The vertebral column must be viewed throughout its whole extent, as to its being fractured, or dislocated, or contused. In doubtful cases it requires strict attention, since injuries to it are often of a very complicated nature." He then describes a case of fatal injury of the spine in the neck with no external indications, and remarks, "In such and similar cases it may be expedient to remove the whole of the cervical column." The history of this case was of course known to the examiner. On the other hand, Virchow, in the reports of those cases which he makes to illustrate his method of medico-legal investigation, makes no mention of the spinal column, but is most exhaustive in his exploration of the three cavities. And yet one may read in the translator's preface to the same book, "They (the autopsies) may be taken as examples of the way in which all post-mortem examinations for medico-legal purposes should be conducted."

In the Edinburgh Regulations we read, "In commencing the dissection of the body, it must be laid down as an unavoidable rule that all the great cavities should be examined, and also every important organ in each, however distinctly the cause of death may seem to be indicated in one of them. It is right to examine the cavity of the spine, and at all events its upper portion, in any case where an unequivocal cause of death has not been discovered elsewhere."

The Method of the North Carolina Board of Health directs that "the opening of the vertebral canal, or of separate joints, is never to be omitted in cases in which any information may be expected from such examination." Taylor and Orth, and many other authors, seem to follow almost to the letter the idea of Casper, "that in every case in which it may seem important to open the spinal column it must not be omitted." Lastly, it would seem clear that so important an organ should not be passed by, if our decision upon the cause of death partakes of the nature of "diagnosis by exclusion." Should any other portions of the body not mentioned above seem to be capable of throwing light upon the investigation, they should be studied.

The question of poison and the necessity of employing a chemist is one that will arise, and to which the examiner must give a definite answer. The burden of proof rests in this case as in the question of opening the spinal column. All authorities giving directions for investigation in such cases commence with the clause "if poison is suspected." This suspicion may arise from the circumstances of the case if they be known, or may originate in the facts developed in the course of the autopsy. In either case the duty is clear to proceed to investigate for poison. It may be desirable also to do so in case the result of the autopsy is entirely negative, as it is hardly right to deny that the cause of death can be found by examination unless we are in condition to speak positively regarding poison.[1]

No mention has been made of the use of the microscope, though there undoubtedly are cases in which it may be used to advantage, but as a general rule the instrument is probably more useful in pathological than in medico-legal investigations.

[1] See an article by Medical Examiner E. P. Miller, in No. 4, vol. i., of the Transactions of this Society, on the Conditions and Circumstances which should Induce the Medical Examiner to Employ a Chemist.

In cases of infanticide, in addition to the search for the cause of death it is necessary to undertake such investigation as shall aim to give answers to each of the three following questions, namely: —

(1.) What is the age of the child?

(2.) Was the child born alive?

(3.) If born alive, how long did it live?[1]

Should suspicion light upon a person as being the mother of the child, the questions to be determined concerning her are: —

(1.) Whether she has been delivered of a child?

(2.) Whether the signs of delivery correspond as to time, etc., with the appearances observed on the child?

In conclusion, then, we can say that the only absolutely fixed requirement of the medical examiner in making an autopsy is the investigation of the three great cavities, and that in addition to this he shall according to his judgment make his work so complete in every case as to be reasonably satisfied of the cause of death, or of the fact that the cause of death cannot be learned by an examination of the dead body.

[1] In this connection I cannot refrain from calling attention to Ogston's Lectures on Medical Jurisprudence, in which, in closing the subject of Infanticide, he gives "directions for the systematic conduct of the medico-legal inspection of the infant." In these directions all the details peculiar to such an examination are abundantly set forth.

ON THE HABITUAL USE OF POISONS.[1]

BY A. H. JOHNSON, M. D.,

Associate Member.

In consenting to present a paper to this Society on the Habitual Use of Poisons, I had little thought of the difficulties in the way of obtaining facts from which to derive any valuable conclusions. Otherwise I should have declined to attempt what must inevitably prove a work of little value.

The learned works of Taylor, Woodman and Tidy, Reese, and many other toxicologists, give brief space to the discussion of our subject, not because of its relative unimportance, but manifestly because of a lack of such knowledge as would justify them in more positive statements. The nature and magnitude of the questions involved give it an appalling intricateness and extent. These questions will probably never admit of more than an approximate solution, and such a solution is to be reached through years of laborious research and experiment. With no practical knowledge of toxicology or chemistry, beyond what is common to nearly every regularly educated general practitioner, it is not to be expected that I can contribute anything to elucidate a subject which such experts find themselves compelled to treat meagrely. Therefore in what follows you will find rather a statement of a subject for investigation than its discussion. Whatever of good may come from such a paper as the present must result indirectly from its exhibition of such ignorance that the feeling of dissatisfaction it creates may awaken a profitable spirit of inquiry.

The numerous definitions of the term poison illustrate Dr. Taylor's statement that "in legal medicine it is difficult to give such a definition of a poison as shall be entirely free from objection." In popular parlance a poison is a substance which, when taken into the human system *in small quantities*, will impair health or destroy life. But many poisons, like nitre or oxalic acid, prove fatal only when taken in doses of from one half an ounce to an ounce. All writers on toxicology that I have consulted, apparently agreeing with the statement of Woodman and Tidy, that "half an ounce can hardly be called a small quantity," avoid the exclusiveness of the popular idea by using in their definitions terms so general that they cease to define.

Webster declares a poison to be "any agent capable of producing a morbid, noxious, or dangerous effect upon anything endowed with life." Dr. George M. Beard, in his work on stimulants and narcotics, adopts this definition as his own, saying that "the qualification 'in comparatively small quantities,' or 'in quantities not very bulky,' might be added, but it is not essential to the definition." According to this the term poison is made to include heat and cold,

[1] Read at the February meeting, 1882.

and the most harmless articles of food. For the most simple food, if used to excess, may *prove* "*capable* of producing a morbid, noxious, or even dangerous effect upon" the body. Thus Dr. Taylor tells us of a young woman who died in consequence of a peritonitis brought on by over-distention of the stomach, produced by eating a quantity of raw rice mixed with milk, yet neither rice nor milk nor the two combined are poisons. Reese, in his work on Toxicology, defines a poison to be "a substance capable of producing noxious and even fatal effects upon the system, no matter by what avenue it be introduced, and this as an ordinary result in a healthy state of the body, and not by mechanical action." Chloride of sodium has proved a fatal poison in doses of from one half a pound to a pound, yet this is not an ordinary result of the use of common salt. It is one of the constituents of the body, and health cannot be long maintained when it is excluded from the daily food. The same objection also applies to this definition as to the one already quoted, namely, that some of the simplest articles of food are, when used to excess, "capable of producing noxious and even fatal results." Dr. Taylor gives the following comprehensive definition: "A poison is a substance which, when absorbed into the blood, is capable of seriously affecting the health or of destroying life." This also includes so much as to lack definiteness, for excessive use of food may seriously affect the health. Dr. Letheby's definition, adopted by Drs. Woodman and Tidy, is as follows: "A poison is anything which otherwise than by the agency of heat or electricity is capable of destroying life, either by chemical action on the tissues of the living body or by physiological action from absorption into the living system." This, the least objectionable of the definitions with which we are acquainted, is still too inclusive, for the reason already frequently repeated.

There is a truth in the popular idea of the meaning of the word poison which a correct definition of the word will preserve: the truth, namely, that evil resulting from the physiological action of some substances is so frequently seen that it is their most conspicuous attribute. The idea of possible impairment of health or of death resulting from their use should always attend their administration, and lead one to carefully restrict the quantity and frequency of the doses employed, and to seek their earliest possible discontinuance. Their use for physiological purposes is warranted only in conditions where their power to exalt or depress special functions may be used to regulate functions already disturbed by morbid action.

I submit the following definition, which sufficiently limits, at the same time that it explains, the application of this word poison: A poison is a substance which, when in any way absorbed into the human system, has so dangerous a power to pervert or arrest the bodily functions that to avoid these evils its entrance into the system must be carefully restricted. This definition, while sufficiently elastic to include all substances properly treated in a work on toxicology, also excludes the innocuous articles of food which can become injurious only when used to gluttonous excess. It also keeps prominent the baneful action of certain substances which secures for them the name "poisons." It is this well-known characteristic which leads us to notice with astonishment and curiosity that some persons habitually use them.

By habitual use we mean a use which is continued at frequent intervals, through many months or years, in obedience to a constitutional or acquired craving, originally begotten by the action of the substance taken.

Conspicuous among the drugs thus used are opium and its derivatives, alcohol, absinthe, tobacco, chloral, and arsenic. It will be with special regard to the action of these articles that the statements of this paper will be made. It certainly would be a waste of time to take space to prove that each one of the above-named drugs has been and is habitually used. Concerning the first four of them the fact is too patent and familiar, and abundantly attested by many medical writers. Concerning the remaining two, we have for one, namely, chloral, the recent thorough investigation of Dr. Kane, published in his book entitled Drugs that Enslave, and for the other the statements of Drs. Vogt and von Tschudi, substantiated by Mr. Heisch and Dr. von Vest, and confirmed beyond a peradventure by the investigations and statements of Dr. Roscoe, Dr. Knappe, of Styria, and Drs. Rutter and Maclagan, of London, in 1864. So that Dr. Taylor, who, in an earlier edition of his work on Medical Jurisprudence, styled the accounts concerning arsenic-eating as absurd and exaggerated, in his last edition admits that they are founded on respectable authority. The testimony with reference to the existence of the arsenic habit s succinctly stated by Dr. Stillé in his work on Materia Medica.

Nor would it be in place here to enter upon a statistical investigation to show the extent to which these habits prevail. For in the first place such statistics have been already presented by recent writers, conspicuous among whom are Drs. Calkins and Kane ; and in the second place it cannot be claimed for such statistics that they present the facts with more than a very rude approximation to accuracy, owing to the secrecy with which these habits are indulged, the untruthfulness of the parties addicted to them, and the reluctance of dealers to acknowledge the extent of their illicit traffic in these drugs; and third, because the practical result of such an investigation for this Society would simply be to prove what needs no additional proof, namely, that many powerful narcotics and stimulants are by many persons habitually used. Moreover, the work of gathering such statistics belongs rather to the sanitarian, the philanthropist, and political economist, who seek to adapt corrective measures to the magnitude of the evils they seek to reform.

We propose simply to comment upon some of the questions to which the well-established fact gives rise.

First, concerning questions relating to the physiological action of poisons. It is evident that this question cannot in all cases be answered by our present knowledge of chemical action. One of the most inexplicable marvels among physical and vital phenomena is the contrary effects which are produced by changes in the adjustments of the molecular constituents of elements. Carbon, hydrogen, oxygen, and nitrogen are each essential components of healthy living tissue, yet a minute quantity of hydrocyanic acid, composed of the apparently harmless elements, carbon, hydrogen, and nitrogen, proves a poison so instantly deadly as to allow no analysis of the method by which it arrests life. Atropine, morphine, strychnia, nicotine, nitroglycerine, alcohol, chloroform, etc., prove fatal in small quantities, although composed of carbon, hydro-

gen, nitrogen, and oxygen, elements which we must breathe, and eat, and drink in gross measure each day of our lives. Hence the fitness of any substance which is habitually used, to be esteemed valuable as an article of food, is not to be determined by the fact that chemical analysis shows that it is composed of the very elements which the body requires. Only the most careful and prolonged observation of the effects produced upon human tissues and functions by the use of a given substance can warrant us in declaring for or against its harmlessness, its usefulness, or its baneful character.

Nor can the fact that there is a general craving for certain articles correctly indicate that they are, aside from a medicinal use, promotive of health and longevity. One might think that it was superfluous to make this statement, yet we find writers appealing to this fact to prove that the widely extended use of certain narcotics and stimulants indicates that they meet a want which is instinctive, and hence whatever is used in obedience to an instinct is not only safely but needfully appropriated.

Anstie in his work on Stimulants and Narcotics says, "It is idle to urge that the subject of a carefully prepared experiment can be made to live in apparent health without the use of any of the substances vulgarly called narcotics, if the practical fact be that *nations cannot* and never have been able to do without them." If by this we are simply to understand that national laws have not availed to abolish the use of narcotics, we can receive it without objection, but at the same time fail to see that this fact indicates that nations *need* to use narcotics to maintain their physical or moral health. If, on the other hand, it is asserted that nations are, and always have been, unable to keep their people up to their largest measure of vigor without the habitual use of narcotics, the assertion is open to quite as much evidence against as in favor of its truthfulness. Nor is it quite in keeping with the experience of a multitude of intelligent observers that those who use none of the so-called narcotics are simply made to live in apparent health. For often the fresh vigor and endurance of one who strictly avoids all narcotics and stimulants contrasts most favorably with the physical powers of those who use them.

Among some statistics, Anstie quotes from von Bibra the statement that all the known nations of the world are addicted to the use of tobacco. But it is scarcely three centuries since Sir Walter Raleigh and others at the court of England, by using the tobacco brought from Virginia by Sir Francis Drake, fairly introduced to Europe the custom of tobacco-smoking. Since then these nations cannot do without it, but none would think of claiming that tobacco has given modern nations any intellectual or physical superiority over the ancients. What one writer says of tobacco is probably true of all other narcotics, aside from their medicinal use, namely, "Moderation is always safe, and total abstinence can do no harm."

Moreover, there is a great error in concluding that an instinctive desire will always express itself in healthful customs. The pleasure associated with the gratification of the appetites, while it secures the use of the means for preserving and procreating life, is always a temptation to over-indulgence. Rea son and virtuous resolve restrain many from an injurious stimulation of thei nerves. But the tendency and practice of by far the larger number of men is

to gratify their appetites, with more regard to present pleasure than to possible results. Especially is this true if the evil of any practice has only an insidious and protracted approach, and in persons with exceptionally vigorous constitutions is unapparent.

Among some of the natives of tropical regions, there is a widely prevalent custom of eating certain varieties of earth or clay. Of the Otomoes on the Orinoco Humboldt says, "They undoubtedly consume large quantities of clay, without injuring their health." We have similar accounts of tribes in Western Africa, in Eastern Asia, and in northern parts of Sweden and Finland. This practice, once formed, we are told, is tyrannical, so that in many cases no punishment is sufficient to restrain those addicted to it. It is referred to by Ribot as presenting a curious instance of morbid heredity. The children of these earth eaters, according to A. von Humboldt, have often to be locked up to prevent them from running out after recent rain and eating clay. "He saw an Indian child, at the mission of San Barjoe, who would eat hardly anything but earth; the child in consequence looked like a skeleton." This custom illustrates, first, the fact that the instinct to gratify natural hunger may misdirect to the use of materials which chemical analysis shows have no properties essential to nutrition; and, farther, that inherited instinct may involve a passionate fondness for substances the eating of which begets emaciation and weakness. In the same way, the widely prevalent use of narcotics simply shows their fascinating effect upon the nervous system and the great power of the artificial appetites they create, qualities which would insure their extensive use, even were the evil effects much more conspicuous, prompt, and certain.

As already remarked, the useful or baneful effects of certain substances when absorbed into the system must be determined not merely by the fact of their chemical constitution, nor from the existence among many nations of cravings for the effects they produce, but from a study of their action upon the bodily functions and tissues.

The results of such a study of the poisons we have enumerated have been presented by many competent scholars and observers, and are accessible to each member of this Society in the many modern works on materia medica and toxicology. With the statements of these writers we assume your familiarity. We do not propose to recapitulate them in detail. By them we are made acquainted with two conspicuous facts: one, that they all have power, and most of them in very small quantities, to pervert or even arrest the bodily functions; the other, that most of them have been and are, by some persons, habitually taken for years in doses ordinarily fatal to one unaccustomed to use them.

Are we therefore to conclude that these articles have two methods of action? or is the difference in these instances simply due to greater or less degree of action, and to greater or less constitutional power of resistance? To determine this point we must have regard to the facts by which we determine the action of poisons. These facts are of two characters: first, those which reveal a modification or disturbance of function; second, those which reveal actual changes in tissues. We find with reference to most of the poisons habitually used, that their special effects upon the tissues, in cases of acute poison-

ing, elude the eye even when aided by the microscope; and that in chronic poisoning from the same drugs the post-mortem appearances are those due to a general perversion of nutrition. Even alcohol may destroy life, and leave no organic traces of the method by which it proved fatal, although in chronic alcoholism many structural changes due to its action are found. Even arsenic, when fatal, by no means always produces destructive changes of tissue to indicate how it destroyed life.

From these facts it is quite evident that as chemistry cannot instruct us as to the safety or danger of taking any substance, without regard to its previous trial upon the living subject, so neither can the microscope tell us what the action of a poison has been without reference to the symptoms it has evoked. But inasmuch as in the grosser action of some poisons like alcohol and arsenic we find organic changes which underlie the symptoms exhibited, and in the action of opium and tobacco detect first derangement of function, and later wasting of muscular tissue, which express the direct and indirect action of these drugs, I think we are right in inferring that poisons, in whatever quantities used, powerfully pervert the normal cell life of the body.

In these days we all conceive of functional activity as due to vital changes in cells, to whose activity the different organs, tissues, and fluids of the body owe their special character. So that there is no change of thought, sensation or motion, or of nutrition or general condition, which the physiologist does not recognize as an expression of the vital changes in the myriads of cells of which the body is composed. Yet we cannot demonstrate to the eye the differences in the functional properties of cells. These we must learn from the special work of the organ to which they belong. This is peculiarly true with reference to the various nerve centres, whose intricacy and delicateness of structure and function not only remove them from exhaustive examination, but even if every cell of every nerve ganglion could be inspected, its normal or its pathological condition might prove as invisible as the magnetic or non-magnetic condition of the molecules of a granule of iron. So although we cannot demonstrate the physical changes produced by a poison in the cell life, which is essential to the performance of any function, we feel no less confident that these changes are present, and that they may often more seriously compromise healthy nutrition and function than some grosser forms of organic disease.

With these facts before us we regard the action of poisons as of the same nature under all circumstances: namely, as due to the molecular changes produced in the fluids and solids of the body, and in the cells which compose them. When these molecular changes reach a sufficiently high degree, they may reveal their existence by structural changes discoverable by the miscroscope or plain to the unaided eye. But long before this may occur life may cease to be possible.

The extent to which such agents do harm cannot be in every case demonstrated. But that they have in all cases the same power, through strictly physical action, to pervert or modify function, must be borne in mind.

Inasmuch as we must in most instances learn their action from the symptoms they evoke, rather than from visible structural changes, we should study the tendency of their effects upon those sensitive yet healthy constitutions

which best reveal them, — as the electrician makes use of the galvanometer to detect the existence and character of the galvanic current. This class, comprising as it does nearly all the female sex, and nearly all who have not passed the period of adolescence, and a very large proportion, if not the majority of the mature males, — forming as it must so large a majority of the human family, — should really be the standard by which we pronounce upon the safe and beneficial employment of narcotics and stimulants. When tested upon such constitutions we learn their alarming power to limit and derange healthy bodily life.

That in certain peculiarly robust constitutions, the evil of their working may be masked by an appearance of great health and energy is by no means conclusive evidence that the narcotic or stimulant used has done no harm. The word often used concerning such cases expresses the truth. We say such an one tolerates a large quantity of his favorite narcotic; that is, the system sustains a burden imposed, and is not being supplied with that which best supports its energies. From the existence of physical evil, produced from the known action of a poison in thousands of persons who would be otherwise healthy, we rightly infer the power of the same agents to produce evil effects in all. The statement of Dr. Boehm well expresses the truth: namely, "The tolerance of a poison indicates a permanent change in the activity of organs which at first resented its administration."

We all know that it is possible for extensive impairment of important structures to occur without such failure of psychical or motor powers as to destroy clear thought or vigorous action. The degree to which such impairment of powers can be tolerated by any constitution depends upon its measure of reserve force. Compensations for injuries sustained, and readjustments of the relative activity of different organs, can occur very often in some persons, not only without arrest of life, but without great curtailment of its useful activity. But, on the other hand, troubles long concealed may at last express themselves, as it were, explosively, when the limit of comfortable endurance is passed. This is illustrated by a remark of Mr. Travers when giving testimony as a witness, and quoted by Dr. Taylor, — to the effect that a man may have pursued an intemperate course for some time, and yet his appearance indicate the plenitude of health, even when he is liable to an immediate attack of delirium tremens. This fact is also illustrated by the period of incubation of specific diseases, during which we have no knowledge of the injurious working of the poison, which nevertheless goes on until its intensity is such as to give rise to disturbing symptoms. Even after apparent health is restored, the existence of an irreparable injury to his constitution may confront one in perversions of development in his children. In like manner the fact that the stimulant narcotics have done their evil work in any person's system may become first apparent in some disturbance of the nervous system in children's children, so that the remark is frequently quoted, "Gout is a disease which the fathers have all the fun of acquiring, and the children all the misery of suffering." And Ribot, after remarking that the passion known as dipsomania, or alcoholism, is so frequently transmitted that all are agreed in considering its heredity as the rule, quotes the instance of a man belonging to the

educated classes, and charged with important functions, who succeeded in concealing his alcoholic habits from the eyes of the public, while his family were the only sufferers by it.

The medico-legal importance of a correct knowledge of the action of poisons which are habitually used appears in their effects upon longevity.

Whether aside from a medicinal purpose they can be wisely used, and if so to what degree, before the boundary of temperate use is passed, and health and length of life are imperiled, are questions to which men of different customs and opportunities for observation return different answers. But it is a very significant fact that sound life insurance companies require an answer from applicants to some form of the question, "Are you now and have you always been of temperate habits of life?" — a question which is understood to have special reference to the use of stimulants and narcotics.

If the medical expert is required to testify as to what constitutes a temperate use of these articles by a healthy person, he finds himself unable to give any precise reply. The degree of toleration of these powerful agents must be determined by the result of individual experiment, and not by any precise rule.

The popular definition of intemperance exhibits the most ludicrous variations. To many it is simply a question of the quantities in which, and the frequency with which, a stimulant is consumed; to others, a question of ability to take large amounts of stimulants without apparently losing control of their faculties. Illustrations of absurd testimony as to the meaning of intemperance may be found in Dr. Taylor's work on Medical Jurisprudence.

But the expert very well knows that such is the power of these agents that to a very large proportion of human beings the smallest indulgence in their use, except as a medicine, is injurious, and therefore intemperate; and that what to a very large class of men appears to be moderate indulgence is too great to remain without effect in seriously perverting nutrition.

The popular judgment seldom considers a man intemperate until he begins to show the evil results of the habitual use of some poison by his slavery to his appetite, and neglect of business duties or social proprieties. But this popular judgment is far too tardy. The injury to the nervous system, of which such injurious practices are the expression, is being slowly wrought for years before the popular verdict is pronounced.

Estimates of the effect of stimulants and narcotics upon longevity are generally based upon their excessive use. But this excess is a result of their peculiar power and special action. The symptom of excess is so frequent a product of their moderate use that it should itself affect our judgment as to the perils which any degree of moderate use may bring to health and length of life.

It is customary with some writers, when discussing the effects of poisons that are habitually used, to adduce many instances in which, notwithstanding a liberal use of narcotics and stimulants, life with a large measure of vigor has been protracted to great age. But the weight of such evidence is impaired from the fact that we are not made acquainted with the family history of such persons. As Ribot tells us, "It is now generally understood that longevity depends far less on race, climate, profession, mode of life, or food than on hereditary transmission. We find centenarians among those who have led the

hardest lives, as well as among those who have taken the greatest care of their health. A collier, in Scotland, prolonged his hard and dreary existence over one hundred and thirty-three years, and worked in the mines after he was eighty." Inherited longevity will assert itself above many influences generally fatal to a high average duration of life.

By application of this law of nature the number of those whose health and life have not been limited by the habitual use of poisons would probably be so reduced that ther emaining number would have but small significance against the multitudes of sensitive constitutions which have been and are sure to be shattered by such habits.

Our conclusions, therefore, respecting the effects of the habitual use of poisons on longevity are more likely to be correct when based upon the known power of these agents to pervert nutrition than when based upon appearances of undiminished health in some users of them. Whatever may be our doubts about the injurious effects of small quantities of narcotics and stimulants upon the system, we should have little hesitation in declaring that when they are long used, and in large doses, they must, in the vast majority of cases, impair health and shorten life, so that the life of any person addicted to such habits is exposed to such additional risk that it cannot be safely insured without great increase of the normal rates. And should an applicant for insurance, when required to state his habits with reference to stimulants and narcotics, conceal the fact that he is an habitual user of them, his executor may justly find, as several have *actually* found, payment of a policy so obtained refused.

Medico-legal questions of grave importance are likely at any time to arise from the effects which the habitual use of poisons may have upon mental disposition and capacity, with special reference to management of trust property, legal responsibility, and testamentary capacity. Some of these questions were so recently clearly treated by an associate member of this Society that I limit myself to one phase of this prolific theme, namely, to the power of the habitual use of a poison like opium, or absinthe, or alcohol, to imperil public and private interests, long before either mental capacity or moral responsibility, according to the ordinary use of these terms, is extinguished. The psychical effects of these drugs exhibit protean forms. But underlying these expressions is the fact that by their physiological action they may control mental disposition and character more effectually than the weightiest moral precepts or social interests. While we cannot hold that all mental life is the product of physiological action, we are called daily to recognize the fact that physical agents, when taken into the system, suppress, or exaggerate, or distort the normal mental faculties. It is evident that they must do this by entering the circulation, and by quickening or retarding physical or nutritive changes in the nerve cells of the brain to which the blood is distributed.

It is a familiar fact that the automatic actions of the different cerebral centres, thus awakened or depressed, may, to a greater or less degree, exceed the power of the will to reasonably coördinate them. No previous perfection of mental poise, or reliability, or moral self-control, can give assurance that the *automatic* action of the brain under the influence of drugs will conform itself to the habits in which it has been trained. This action is mechanical, irre-

sistible, often tumultuous. The centres of thought may be stimulated, or unevenly excited, or depressed, and this not in obedience to a volition based upon judgment, but by reason of a physical agent which may keep in dominant activity suggestions and inclinations ordinarily repressed. The result is to pervert mental and moral character by a twofold action; one direct, the other indirect. *Directly*, by the immediate influence of the poison on cerebral action, and the morbid craving for a repetition of its use which it creates; indirectly, by the violence to the moral sense, which consciously or unconsciously occurs when once the controlling power of an appetite becomes apparent to its victim, and he realizes that he has educated a constitutional craving into strength, by which it actually cajoles and dominates his will. When one perceives that the inclinations and deeds called forth by the effects of drugs are departures from the ideals of living which his conscience approves, yet still in obedience to habit incites their repetition, each successive fall brings the conviction of moral cowardice, and remorse, and loss of effort to maintain former standards of prudence or morality. Transformations of character thus produced may proceed until a man's disposition and conduct have undergone a complete reversal before either mental capacity or moral responsibility is extinguished. Especially does this change appear in his disregard of the wise public sentiment which condemns the surrender of his powers to the habit by which he is controlled, and in his indifference to and sacrifice of the domestic comfort and social interests of his family.

Suppose the case of one, who, by reason of an established character for business ability and probity, has been selected by a testator to manage, as trustee, a large property. Should this trustee subsequently, by the habitual use of some stimulant or narcotic, change from a watchful, prompt, enterprising business man, of equable character, into a slack, indifferent, negligent, moody, unreliable person, it is manifest that he is no longer the man selected for the trust he holds, although his capacity to transact business may be simply dormant or perverted, unexercised, not destroyed. The removal of such a trustee for a substitute, whose characteristics should be like those of his predecessor when first appointed, may be properly prayed for, and the prayer sustained by the most positive medical testimony concerning the power of drugs, when habitually used, to *pervert* the use of the mental faculties, which is often worse than their abolition. Even when the perversions of character are transient, as happens more or less frequently during indulgence in the alcohol or opium habit, the perils from the acts of one under the influence of his favorite poison should insure his displacement from positions of trust.

The effects of the habitual use of poisons or a poison on testamentary capacity may frequently prove a subject for examination by the courts, and is likely to meet an unjust decision unless a more liberal construction of the term "capacity" be allowed than at present prevails.

We are told that a person is considered to be of a sane and disposing mind who knows the nature of the act which he is performing, and is fully aware of its consequences.[1] And again, as in a case decided by Sir H. Jenner, "a person has testamentary capacity who has conducted his affairs with great

[1] Taylor, page 824.

shrewdness and ability, who does not labor under imbecility, and who has been treated during life as a person of indisputable capacity by those with whom he had to deal."[1] In cases of habitual intoxication, testamentary capacity has been allowed, provided the mind has not been sufficiently enfeebled to render the man incapable of exercising his judgment.[2]

A similar decision was given quite recently in a suit against the estate of John Hooper, of Marblehead, by Judge Choate, of the probate court of Essex County.

That gross injustice may occur from decisions based on these grounds is apparent from the fact that great estrangement of affection and perversions of natural character may take place without imbecility or limitation of shrewdness. This may be shown to have resulted in some instances as the direct consequence of the alcohol or opium habit. It may be shown that slavery to some stimulant or narcotic has turned a devoted husband and exemplary father from a lovely wife and children to live with harlots. It may be shown also that the kind efforts of wife and children, continued with much long-suffering and patience, to turn him from his habits have only served to intensify feelings of hostility toward those who have the strongest natural claim to his love and help. If, then, as the result of such an estrangement from his family, he should will his property to comparative strangers and companions in vice, why should not the court decide that a mind not enfeebled but controlled by the perverting influence of a drug cannot hold the legal right to alienate the property interests of legal heirs without just cause? If a will may be set aside on the plea of undue mental influence, why not also when the undue influence comes from a physical agent like opium or alcohol? If also during life it is lawful to protect the property of an inebriate's family, by putting him under guardianship, why shall not the law exercise the same judgment concerning the justice of his acts when, owing to the action of poison in his blood, he makes an unnatural will, although no mental imbecility, in the technical sense, can be proved?

In addition to the medico-legal questions which arise from the direct effects of some poisons, when habitually used, grave legal complications arise as an indirect result of such habits. First, the acquired toleration of a poison, like opium, or chloral, or arsenic, in doses greatly exceeding those ordinarily fatal, might cause the system to successfully resist a dose given with murderous intent. In such a case, if it be shown that the preservation of the victim was due to an acquired habit, and that the drug administered would in the great majority of instances produce fatal sickness, the immunity of the person poisoned would not palliate the felony of the poisoner.

On the other hand, concealment of the opium or chloral habit may lead to the innocent administration of a fatal dose by some friend or physician, who is unaware of the quantities already taken.

Questions of malpractice might easily arise from the peculiar susceptibility which the habitual use of one poison may beget to another. Thus one addicted to the chloral habit may become specially sensitive to the effects of alcohol or opiates, while the power of chloral and morphine to intensify each

[1] Taylor, page 827. [2] Ibid., page 829.

other's action may cause an otherwise innocuous dose of chloral to arrest life.

The degree to which one poison may limit the action of another may assume a very critical importance in cases where a poison has been habitually used. Thus, while the extreme limit of time before the special effects from a poisonous dose of arsenic should appear is sixteen hours, Dr. Taylor quotes a case reported by Mr. Clegg in the *Medical Times* for October, 1848, of a girl who showed no symptoms of violent irritation from arsenic until twenty-three hours after the dose was taken.

Those who are habitual users of some poisons are more liable than others to sudden death. This may be due to the so-called accumulative action of poisons, or to the exhaustion of the power of functional compensations, or to the acquirement of susceptibility to a poison, or to the advanced destruction of tissue due to the habitual use of a poison which has been apparently well tolerated, or to a rash increase of the dose beyond the system's power of resistance.

In many such cases a suspicion of suicide or murder is likely to arise. The fact that the deceased was in the habit of freely using a poison in doses ordinarily fatal may either divert suspicion from an actual murderer, or unjustly fasten a suspicion of crime on an innocent person. If the habits of the deceased are known, the possession, use, and fatal effects are reasonably accounted for without necessarily criminating others who may nevertheless be guilty. On the other hand, if the deceased has concealed his habit, the presence of poison in his tissues after death, as when arsenic has been taken, and in the possession of one associated with him during his last illness, may lead to the arrest of an innocent person for murder. The general principles controlling such cases have received discriminating comment from Dr. Taylor, but each case will produce its interesting complications, to be unraveled in the light of its special circumstances.

Our treatment of our theme thus far includes the following items: —

(1.) A definition of poisons designed to make the danger from their use conspicuous.

(2.) Recognition of the fact that they are largely habitually used.

(3.) That their fitness for such use cannot be determined by chemical analysis.

(4.) That a widely prevalent craving for them cannot indicate that they have value as food.

To which we might have added that did they contain the constituents for nutrition, the quantities in which they are taken would give them trifling value in comparison with ordinary food.

(5.) That as the physiological action of poisons cannot be determined by chemistry, so neither can it in all cases be determined by the microscope, but that

(6.) Reasoning from the gross changes of tissue they often produce, and from physical analogies, we rightly infer their power to pervert or control the cell life of the body.

(7.) That their real effects and power must be determined by the symptoms their physiological action evokes.

(8.) That our generalization from such symptoms should be made from their effects upon the more sensitive constitutions, which form the vast majority of the human family.

(9.) That, tested thus, they reveal such evil power that we conclude they must have a similar influence upon all, and that in more robust constitutions the evil they work is masked by compensations made possible by a higher degree of vigorous life.

(10.) The medico-legal importance of our topic is noticed (*a*) in comments upon the method of examining the effects of an habitual use of poisons upon longevity, with special reference to life insurance; (*b*) in comments upon the effects of an habitual use of a poison upon mental disposition and capacity, with special reference to management of trusts and testamentary capacity.

(11.) As the indirect result of the habitual use of poisons we noticed: —

(*a.*) That acquired toleration of a poison in doses ordinarily fatal may cause the system to successfully resist a dose given with murderous intent.

(*b.*) That the concealment of a habit of using a poison may lead to the innocent administration of a fatal dose.

(*c.*) That the degree to which one poison may limit the action of another may have great importance in determining whether or not a poison has been feloniously used.

(*d.*) That in the case of the sudden death of an habitual consumer of poison the habit, if known, may conceal an actual murder by poison, or, if unknown, may give rise to unjust suspicion.

With this fragmentary and very general treatment of our topic, which has exceeded the limits custom assigns to papers for these meetings of your Society, I leave it to receive more instructive elucidation at the hands of those who have better opportunity to give to it the thorough investigation it deserves.

REPORT OF A CASE OF HOMICIDE.[1]

BY MEDICAL EXAMINER C. C. TOWER, M. D.

On the evening of Thursday, July 7, 1881, I was notified by the selectmen of Braintree that the dead body of a person had been found in that town under circumstances which justified a supposition of violence. I immediately proceeded to the place where the body lay, which I reached shortly after nine o'clock. The night was cloudy and quite dark, requiring the use of lanterns to inspect the remains.

The body was that of a man five feet five inches in height, and, as I learned on inquiry, fifty-six years of age, and of an average weight of one hundred and forty pounds. It was lying in a recently mown field of grass four feet west from a high stone wall and parallel to it, the head being directed towards the south. Ten feet distant, in a northerly direction, was a farm-gate which opened into the field from a public highway called Liberty Street. No missiles, weapons, or other instruments of violence were discovered in the vicinity of the corpse. The position was right dorsal, the head being slightly turned to the left, the face looking upwards. The right arm was bent at the elbow, the forearm being elevated at an angle of nearly ninety degrees. The left arm was slightly flexed, the hand resting on the left hip. The right leg was strongly flexed, the foot lying beneath the left knee-joint. The left leg was extended.

The clothing consisted of vest, pants, and white cotton shirt, the sleeves of the latter being unbuttoned, ripped at the seams, and turned backwards underneath the shoulders. The head and feet were uncovered, the soles of the latter soiled and hardened, indicating that the deceased had been traveling barefoot.

The body was in a considerably advanced state of putrefaction, and emitted a strong stench. The features were swollen and distorted beyond recognition ; the color blackish, resembling that of a negro. Numberless larvæ in an active state covered the mouth and nostrils. The eyelids were wide open, the humors of the eye apparently coagulated and projecting in a spiral form from the corneæ. The scalp, particularly over the left parietal region, was emphysematous and softened. The upper lip presented at one point a slight protuberance, but no solution of continuity on its outer or inner surface. The teeth were secure and the tongue entire. The forefinger of the right hand bore marks of previous amputation, which, with a scar on the left arm, were the principal signs by which the remains were recognized.

The clothing having been removed, the skin covering the chest and abdo-

[1] Read at the Annual Meeting, June 13, 1882.

men presented a greenish-brown color, the cuticle being separated in small patches from the underlying derma by bloody serous fluid and by bubbles of gas of putrefaction. The whole trunk was greatly distended, so that the clothing, when it was unbuttoned, snapped apart, and could not easily be brought together again. The scrotum and penis were enormously swollen, the latter spirally twisted.

Not having with me my rubber gloves, a short piece of lath was used to remove the maggots, and in a measure assist in the examination of the body. Every portion of the body externally was carefully inspected, the corpse being turned one way and the other to fully expose every part. The sphincter ani was relaxed, and considerable fecal matter covered the adjoining region. *No external mark of violence was anywhere found.* The skin was nowhere broken, and the examination thus far failed to reveal any fractured bones.

On inquiry, I learned that the dead body had been discovered about three hours before my arrival by a person walking along the street, whose attention was directed to it by the offensive smell. I also learned that the remains were those of William McCornish, a laborer, employed up to Saturday night of July 2d at a tannery in the village of North Braintree. McCornish was described as a man of intemperate habits and subject to periodical attacks of dipsomania, but he had been steadily engaged at his occupation of late, and was perfectly sober when paid off at the end of the previous week. Since that date, and up to the night of July 4th, he had been indulging his appetite for strong drink. He had been seen to pass along Liberty Street, within half a mile of the spot where his lifeless body was found, as late as ten o'clock on the evening of the national holiday. He was then barefoot, hatless, and otherwise dressed as above described, and evidently under the influence of alcoholic liquor. At a later hour he was believed to have been in the company of James McKenney and others, engaged in a midnight carousal. Such was the history, so far as I could ascertain it at the "view," of the last days and hours of the deceased. Although there were those present who, cognizant of these facts, were ready to declare "foul play," yet no evidence was presented to the medical examiner which was not perfectly consistent with the conclusion arrived at that death was the result of alcoholism. The remains were accordingly turned over to the undertaker for burial.

On Sunday, July 10th, James McKenney was arrested and held in custody on suspicion of having caused the death of William McCornish. On Tuesday, July 12th, I caused the body of McCornish to be disinterred, and made an autopsy in the presence of two non-medical men as witnesses. The putrefactive changes had advanced since the previous examination. The integuments were softer and more distended with gases.

On making the customary linear incision and dissecting the soft parts from the chest wall, the cellular tissues immediately below the left clavicle and the pectoral muscles on the left side were found to be infiltrated with particles of dark clotted blood. The second, third, fourth, fifth, and sixth ribs on both sides of the chest were fractured transversely at points parallel with the sternum, and about an inch from their attachment to the cartilages. The second and third ribs on the left side were also broken in a second place about an

inch and a half outwardly from the first mentioned fractures and in an oblique direction. The fractured ends of the latter were somewhat splintered. The anterior surface of the left lung was extensively lacerated, and also infiltrated with dark clotted blood. The heart presented two ragged openings at its apex, one communicating with each ventricle. The pericardium contained little or no blood. The left pleural cavity contained by estimate three pints of clotted blood. On the costal surface of the liver were seen three parallel linear furrows, not penetrating the capsule, about three inches in length and three quarters of an inch distant from each other, corresponding in position to the edges of the adjacent ribs. The other organs of the chest and abdomen were sound and free from injury with the exception of slight pleuritic adhesions over the right lung. On examination of the head the skull was found to be uninjured, the dura mater normal, and the brain diffluent.

On Monday, July 18th, an inquest was held by Justice Bumpus, of the East Norfolk District Court, and the prisoner recommitted to the Dedham jail to await the action of the grand jury. The case was presented to this body on the 6th of September, and a bill of indictment for murder was found. The trial before the Supreme Judicial Court for Norfolk, Justices Devens and Allen on the bench, commenced May 17, 1882, when James McKenney was arraigned for the murder of William McCornish. The prisoner was represented by John Eldridge and James J. Mahone as counsel. Attorney General Marston and District Attorney French represented the government.

The prosecution attempted to show that the injuries testified to by the medical examiner were produced by the prisoner, and that they caused the death. The line of defense went to show that the injuries described might have been accidental or made after death.

It is not my purpose to review in this paper the testimony produced in court except so far as it may be relevant to the medico-legal bearings of the case. Every government witness but one, who testified on this particular point, stated that no stones were lying near the body when discovered in the field. This witness stated that a stone as large as a spittoon, to which he pointed in the court room, lay within two or three feet of the head of the corpse.

Government witnesses described the wall as built mostly of rough split stone, three feet in thickness at the base, and two feet at the top, the height being four and one half feet on the street, and five and one half feet in the field. The face of the wall presented a plain perpendicular surface, the back of it being irregular, the stones projecting further into the field as they approached the base. These were mostly secure excepting a few small stones, which had probably been placed on the jutting shelves after the wall was built. The wall was not cemented. The field was situated on the westerly slope of a hill, the declination being gradual, and directed away from the wall.

Two undertakers and other government witnesses testified to the careful handling of the body in placing it in the coffin, — which was a large box, such as is usually employed to inclose caskets, — and to the subsequent care in transporting the remains to the cemetery, and in the burial and disinterment.

One witness for the defense testified to the thrusting of a stick by the med-

ical examiner into the dead body; to the careless handling of the remains by the undertakers; and to seeing near the body as it was lying in the field quite a large bowlder stone, weighing some fifteen pounds or more, which he subsequently picked up. This witness, on cross-examination, admitted that the stone was found several rods from the gate, while, as already stated, the body lay only ten feet from it!

In giving my testimony concerning the external appearance of the body, both at the "view" and at the autopsy, I stated that the chest and abdomen were greatly distended. I stated also that at the autopsy the ends of the fractured ribs were in apposition; that although broken there was no displacement of the bones, and no depression of the sternum, these parts being kept in their proper position by the inflation of the cavities beneath with putrefactive gases; and that there was no evidence of disease or injury in any part of the body except as already stated.

My opinion of the cause of the laceration of the lungs and heart was declared to be that forcible pressure on the sternum and ribs was exerted to a sufficient degree to break the latter, and thrust their fractured extremities into the underlying organs; that the injuries were produced by violence, the kind of violence being forcible and repeated acts performed by an assailant's knees, applied to the front of the chest, combined with the weight of the assailant's body; or, possibly, that they were produced by the feet of a man in jumping; that death resulted in consequence of the injuries so inflicted; and that the breathing of the victim continued a few moments only after the receipt of the injuries.

Being interrogated by the district attorney as to the temperature of the atmosphere at the time of the "view," and for two or three days before, I answered that the highest temperature on July 7th, 1881, as recorded at the United States Meteorological Office in Boston, was 81° F.; that the temperature on the evening of that day (when the "view" was held), was 67° F.; and that during the three preceding days it had reached 80° F. every day except one.

During the cross-examination, the counsel for the prisoner elicited the fact that no mention had been made, in my description of the autopsy, of the condition of the pericardium. I then testified that I had made no memorandum in my note-book of the state of this organ, but that to the best of my recollection it was ruptured, and contained little or no blood. I was also questioned at some length by the defense concerning the condition of the liver; whether it was that termed "drunkard's liver." I replied that the liver of a drunkard presented no peculiar appearances by which it could be positively diagnosticated from the livers of persons who were not drunkards; that I was familiar with what is known as "drunkard's liver," and that the liver examined at the autopsy presented no appearance of that condition. I stated that it was my custom in making autopsies to incise the different organs in order to ascertain their condition throughout, and that I presumed I did so on this occasion, but did not remember all the details of the operation. I was also asked whether I found any trace of alcohol in the brain, and replied in the negative; that in my opinion, in the advanced state of putrefaction of that organ, it would be impossible to determine the presence of alcohol.

Having given in substance the material points of medico-legal interest in my testimony, we will turn our attention briefly to that of the medical experts, four of whom testified at the trial, two being summoned by the government and two by the defense.

Medical Examiner F. W. Draper, lecturer on forensic medicine in Harvard University, having taken the stand, testified that he had listened to the description of the medical examination as given by Dr. Tower, and that, assuming his statements to be true, death was caused by shock and hæmorrhage, the result of severe injuries to the heart and lungs by the application of violence to the front of the chest; that force applied externally to the thorax sufficient to break the ribs inwardly would subject the heart to great pressure, and the vessels of the lung would be torn, occasioning serious, if not fatal, hæmorrhage; that the amount of blood in the left pleural cavity was not enough, by itself considered, to cause death by hæmorrhage; that it would be impossible to give more than a guess as to the proportion of blood which escaped from the wounded parts before death and that which oozed away after death; that in his opinion the injuries were inflicted before death; that the large amount of blood effused was useful in determining this point; that the splintered condition of the broken ribs on the left side of the body, the extent of the fractures of the bones and that of the rupture of the organs, indicated that these injuries were caused while the victim was still alive, because fractures made on the dead body are usually transverse, and without splintering, and because an amount of violence sufficient to break the heart and lungs in a dead body would have left undoubted marks — solutions of continuity — on the surface, whereas it is not uncommon to have in the living body extremely severe lesions of viscera by external violence without leaving any external trace; that the injuries discovered could be best explained as having been caused by the knees of a man pressing on the front of the victim's chest, and the extent and nature of the injuries — the double fracture of the ribs and the double injury of the heart and lungs — rendered it probable that the blows with the knees were repeated, and not confined to a single act of pressure; that the relatively greater amount of injury on the left side of the thorax favored the view that the death was by homicide, since this corresponded with the position and greater force of the right knee of an assailant.

It would be impossible, according to the testimony of this witness, for a man to fall or roll from the top of a stone wall, five and a half feet high, or for a stone to roll from such a wall upon him, and cause fatal injuries, such as those described, without causing other injuries, such as wounds of the face or fracture of the bones of the arms or fore-arms, or of the clavicles, that would be manifest on post-mortem examination. The only circumstances of an accidental nature that would readily account for the fatal lesions would be these: The deceased might, by running rapidly toward the wall, gain a considerable momentum, so that if, in attempting to leap the wall, he tripped, he would fall heavily forward in such a manner that, his head and arms being thrown backward, his chest would come against a stone of a size and shape to fit nearly the whole front of the thorax. It would be impossible that the lesions

found could have been caused by such handling of the body subsequently to its discovery as was described in the testimony.

Assuming that the heart, lung, and ribs were all fractured, as described by the medical examiner, it is probable that death was instantaneous; certainly McCornish must have been incapable of resistance or of voluntary locomotion after these injuries were received.

On cross-examination he testified that he did not feel ready to place much stress upon the existence of extravasated blood as a sign of injury received before death. Clotted blood indicates only a probability, not an absolute certainty, that it was effused before death. The large quantity of blood in the left pleural cavity seemed to him to show that it was set free before, and not after, death. He would not be able to distinguish, by the external appearances of a body, between emphysema by air from injured lungs and that by the gases of decomposition. Bruise marks would not be visible after three days if decomposition, as described, had taken place. The heart resists decomposition longer than most other internal organs. The injury to the left lung in connection with the amount of blood which had escaped into the left pleural cavity was sufficient, in his opinion, to cause death.

Dr. W. C. B. Fifield, surgeon to Boston City Hospital, corroborated the testimony of Dr. Draper in almost every essential point. He attributed the injuries to violence inflicted during life; the kind of violence to have been a crushing force applied somewhat unevenly to the anterior surface of the chest, such as might be produced by a man kneeling on the breast of a person beneath him. More force, in his judgment, would naturally be used by the right knee than the left. Thus the multiple fractures on the left side of the chest, and the laceration of the lung on that side and not on the other, might be accounted for. From the description of the injuries he should say that the violence was repeatedly applied. He did not think it of much consequence in this case that the body should have been kept in the position in which it was found, in order to determine the cause of death, although it is of great importance in some cases. He did not consider that the conclusions as to the death reached at the autopsy were less valuable or correct because the body had been removed from the spot where it was first seen. From the description of the injuries, death, in his opinion, was caused by laceration of the lungs and heart, as the result of outside pressure. He thought it impossible for the deceased to have received the injuries by falling from the wall. A stone falling from a great height *might* produce such injuries, but such height must be far greater than that of the wall described.

Dr. Henry G. Clark, surgeon, having heard the evidence of the medical examiner, testified that the injuries as described by him were sufficient to have caused death, but that they were not necessarily fatal, *limiting them to fractures on the right side of the chest and to hæmorrhage into the right pleural cavity;* that if the injuries were fatal, — taking into consideration all the facts: that the blood escaped from the lung and small vessels, and not from any large vessel, — some little time, from a few minutes to half an hour, must have elapsed before death took place, because blood does not flow in any great quantity after death unless from a large artery or vessel; that three pints of blood

are a larger quantity than could have flowed in this case after death; that rupture of the heart either did not exist, or was caused by the post-mortem; that it was possible for one act of violence to have caused the fractures; that if the blow was a violent one, given upon the sternum, or caused by a fall upon something hard like a stone, it would have been sufficient to produce the fractures by a single act; that the breast-bone will resist much greater force than the ribs; that he should not attach much importance to the fact of the fractures being transverse as an indication of having been produced before or after death, but should regard the circumstance of the fractures of the ribs being in a line with each other as an indication that they had been caused by a single blow; that the rupture of the lungs must have been produced during life; and that the injuries might have been received from a fall from a wall five and a half feet high.

There would be no way of distinguishing, according to this witness, between the effects of a blow from a stone falling upon a man's chest, or thrown upon it, and those produced by a man falling and striking his chest against a stone. He did not think the injuries could have been made by the wheels of a heavy team. In his judgment the position in which the body was found was not that occupied by the person when he was struck. He thought he lived long enough to have turned over.

Cross-examination: He considered it quite possible that the injuries might have been caused by the knees of a very heavy man using force. Jumping with the feet might also have caused them, if the assailed party was lying prostrate. In reply to a question, he said that the heart may resist decomposition longer than other organs, provided there is no fatty degeneration. He further said there was no evidence of fatty heart in this case.

Dr. Thomas Waterman, assistant demonstrator of anatomy in the medical department of Harvard University, testified that death took place from laceration of the lung, from hæmorrhage and shock, and that the deceased might have lived from fifteen to thirty minutes after the injuries were received, as, in his opinion, the hæmorrhage was gradual by leaking from small pulmonary vessels. In the absence of positive evidence that the pericardium was torn, and understanding the medical examiner to testify that it did not contain blood, he should say that the wounds of the heart were made during the autopsy. He did not think it strange that no ecchymosis was found externally; he should not expect to find it where the force of the blow was spent, not upon the skin, but upon the internal organs, producing such extensive and serious internal injuries. Falling from a wall five and a half feet high could not have caused the injuries described. A stone of fifteen to forty pounds' weight falling from a wall of this height upon a man lying on the ground, four feet distant from the base of the wall, could not have caused the injuries, but a stone of one hundred pounds' weight might have done so. The injuries might have been received by a man, rum crazy, running on the top of this wall, and purposely throwing himself from it, by striking a rough stone either attached to the wall or lying near it. The hypothesis, however, was rather improbable. Placing the body in a box, carting it two or three miles, taking it out and burying it, could not have caused the injuries. The laceration of the liver was not a mortal wound, and might have been recovered from.

This concludes the medical testimony. It will have been observed that while all the expert witnesses agreed that the injury to the lung, hæmorrhage, and shock were sufficient to have caused the death, the witnesses for the government and the defense assumed opposite views as to the existence of the lesion of the heart and the pericardium, the medical examiner not having been able to swear upon the stand whether or not the latter organ was perforated. Obviously this uncertainty had an important bearing on the question of immediate death, or of its occurrence after a longer or shorter interval. The failure of the medical examiner to have observed closely at the autopsy the condition of the pericardium, or his failure to have recorded the circumstance of the inspection of this organ, proved in this case, so far as it had any important weight, to be a loop-hole for the defense. Fortunately for the ends of justice, the injuries to the lung alone were considered by all the experts sufficient to have produced fatal results.

The matter of incising or not incising the liver would not deserve special remark were it not that it was called in question at the trial. Such a procedure would not ordinarily be incorporated in the record of an autopsy, inasmuch as it is the universal practice among medical men, while conducting post-mortem dissections, to make incisions into all internal organs, with a view of ascertaining their structural condition. The circumstance that the medical examiner was catechised upon this point only enforces the importance of what has been impressed upon us so ably by our president (in his address, What Constitutes an Autopsy?), of the utmost care in all the minutest details of an examination for medico-legal purposes, as well as of making a full and accurate record of the same. As the trial frequently does not take place for a long time after the autopsy, — in this instance nearly a year, — no reliance should be placed on the unaided memory.

One other point in this connection requires notice. It has been my invariable custom, hitherto, to invite medical gentlemen to be present as witnesses at an autopsy. By some unfortunate chance none were invited on this occasion. Two motives may have deterred me from so doing: first, from the conclusions arrived at during the "view" I had no reason to expect to find internal injuries; second, I did not feel like imposing on my medical brethren such a disagreeable duty, as I knew this would be, without adequate compensation. It was made only tolerable to myself by the free use of disinfecting solutions, and by thorough protection of my person. The views of the attorney-general concerning the fees of witnesses at autopsies[1] are pertinent to this point: "No compensation being fixed by law, they [witnesses] ought to be allowed such fees as, under the circumstances, are just. They may be, and in some cases ought to be, medical men, capable of sustaining the medical examiner in his view of the cause of death where it may require learning and experience. To ask a medical man to attend on such an occasion for the paltry fee of fifty cents is not only manifestly unjust, but unbecoming the dignity of such an inquiry."

The advanced state of putrefaction in which I found this body, considering, from a knowledge of the facts, that it could not have been dead more than

[1] Published in Appendix to Transactions No. 2, vol. i., of this Society.

seventy hours, was to me a matter of some surprise. According to authorities, from ten to twenty days usually elapse before the development of such putrefactive changes as were here present. It must be remembered, however, that a temperature of from 60° to 80° F. is that most favorable to decomposition. The remains lay exposed to the direct heat of a blazing July sun nearly all the day-time — the heat being doubtless intensified by reflection from the wall — for three consecutive days, during which period there was no rain to cool the atmosphere.

This state of putrefaction rendered the discovery of marks of violence on inspection almost impossible. The tumid and discolored condition of the integuments completely obscured all marks of contusion, if they had existed. Ecchymosis could not possibly be detected, and swelling could not be discriminated from post-mortem distention. Moreover, according to Ogston, "putrefaction not only gives rise to appearances which imitate contusions, but it also, in a short time, obliterates all traces of them when actually existing."

To putrefaction I also attributed, in a great measure, the position of the limbs, especially of the right fore-arm, which was raised in nearly a perpendicular direction and without support. "It is well known," says the author already quoted, "that violent and painful diseases which prove suddenly fatal are favorable to the rapid formation of gases, which by agitating the limbs give rise to movements in the corpse mimicking those of life."

The absence of downward displacement of the sternum and attached portions of fractured ribs, which was described in my testimony, was attributed to the expansive force of gases generated within the body during the putrefactive process. Both at the "view" and at the autopsy the anterior surface of the thorax was noticeably full and tense. Moreover, no mobility of the fractured bones was observed while moving the body or in making the primary incision at the autopsy. Only when revealed by the dissection was the existence of fractures made known. There is reason to believe that had the body been discovered soon after death the sternal region of the chest would have been noticeably depressed.

Concerning the opinion expressed by one of the expert witnesses that the rupture of the heart took place during the autopsy, or otherwise did not exist, no more need be said than that this opinion was based upon a misapprehension of the location of the injuries as described by the medical examiner. From an examination of the stenographer's report of the testimony given at the trial it appears that this witness took for granted that the injuries and the hæmorrhage were in the *right* side of the chest instead of the left. Obviously it makes all the difference in the world whether the injuries were sustained in the right side or the left, for the heart, lying chiefly in the left cavity of the chest, could not be punctured in the manner described if the fractures were *limited to the right side.* The cause and manner of death, as well as the length of time which intervened between the receipt of the injuries and death, were all, in the judgment of this witness, determined upon a basis which was erroneous. There was, moreover, no evidence presented at the trial to show that the post-mortem dissection was carelessly made. The fact that the heart resists decomposition longer than other internal organs, as testified to by one

of the government experts, and virtually assented to by this witness, — with the proviso that no fatty degeneration or other pathological condition of the organ existed to account for its softening, — threw the burden of proof, that the heart was torn during the examination of the body, upon the defense, which was not established.

It is well known that while the external surface of a corpse may undergo rapid putrefaction under circumstances favorable for its occurrence, the internal organs, especially the parenchymatous organs of the chest and abdomen, are usually much less advanced in decomposition. Such was the condition of the internal structures witnessed at this autopsy. Not only were the solid organs — the liver, kidneys, heart, and lungs — in a tolerably firm state of consistency, but the organs were less soft than is often found in bodies dead of acute disease when no putrefactive change has occurred. The brain alone was in an advanced state of softening, a condition easily accounted for when we consider that the head was uncovered and directed towards the south, thus receiving the full force of the sun's heat, and that this is one of the organs which under ordinary circumstances earliest commences to putrefy. Not only "the heart," but also "the lungs," according to reliable authority, "resist putrefaction for a long period, and traces of disease are distinguishable in them long after other organs are quite decomposed." "The liver," too, it is said, "may remain firm and compact for some months after death." As a matter of fact the heart was not friable, but firm and contracted, and containing two rents.

For the same reason that the internal organs of the trunk were found to be in a sufficiently good state of preservation to bear careful examination, was capillary hæmorrhage into the areolar tissues and the pectoral muscles of the left thorax clearly distinguishable, although ecchymosis externally could not be distinguished from post-mortem discoloration. That internal ecchymosis was discovered is proved by the fact that only on the left side, at the seat of the most extensive and severe injuries, was this appearance manifest. That the hæmorrhagic infiltration of the tissues alluded to was not a cadaveric condition is shown by its location on the upper instead of the lower portion of the body, and where it would not be produced by gravitation.

The testimony other than medical which was offered at the trial was very conclusive as to the guilt of the prisoner. The case having been given to the jury, that body, after retiring over night, brought in a verdict of murder in the second degree. A sentence was imposed by the court of imprisonment for life, one day of which was to be solitary.

THE MEDICO-LEGAL RELATIONS OF CHRONIC ALCOHOLISM; ITS PATHOLOGICAL ASPECTS.[1]

BY MEDICAL EXAMINER G. K. SABINE, M. D.

ALTHOUGH the acute form of alcoholic poisoning is not unfrequently the immediate cause of death, and the chronic alone rarely so, the two are so often combined that the signs of the latter should be familiar to the medical examiner.

Of all the various conditions that are attributed to the habitual use of alcohol but very few, if any, are pathognomonic. The statements of different observers vary greatly in regard to the post-mortem appearances of the chronic as well as of the acute form, and the question to what degree certain diseases may be attributed to this form of poisoning remains an open one. In fact, almost every known chronic affection has been attributed some time or other to the intemperate use of alcohol. It is probably the fact that the remote is frequently looked upon as the immediate cause. That the habitual and long-continued use of alcohol so alters the tissues and impairs their functions that they are more prone to become diseased there can be no doubt.

Perhaps there is no question which the medical examiner is more frequently called upon to decide than whether or not he has to deal with a subject who has been an habitual drunkard.

Although no single pathological condition is sufficient to determine this positively, yet there are certain ones which point strongly in this direction, and the same inference can be drawn from others taken collectively which are almost equally conclusive.

Among the various pathological conditions resulting from chronic alcoholism are the following: —

CHANGES IN THE SKIN.[2]

In the earlier stages of this affection the skin is remarkably smooth and soft, owing to an increase in the fatty tissue. According to Frerichs [3] the secretion contains a larger amount of oil than normal, a condition similar to that which exists when cod-liver oil is taken in large doses for some length of time. Later on the skin becomes dry, and on the extremities hard and inelastic.

Acne rosacea, consisting of an inflammation and even suppuration of the sebaceous glands, is among the characteristic symptoms of the intemperate use of alcohol. The nose and face are its favorite seat. Besides the nodules the

[1] Read at the Annual Meeting, June 13, 1882.

[2] The following statements are largely taken from Baer.

[3] Klinik der Leberkrankheiten, l. c., S. 319.

skin is reddened, owing to the dilated capillaries and consequent blood stasis, and is also infiltrated to a greater or less degree.

THE BLOOD.

The most striking change in the blood is an increase in the watery elements and diminution in the fibrine. It contains much serum, forms no coagula, or only very small ones, and is of a very dark color; hence the term "venous plethora," used by some of the older authors. The dark color is explained by an increase in the hydrogen and carbon (Steinheim); or by a destruction of the red blood corpuscles (C. H. Schulz), so that less oxygen is taken up and less carbonic acid given off. Another peculiarity presented by the blood is the increase of fat contained in it. It has been stated that not unfrequently the serum of blood drawn from a person suffering from delirium tremens is more or less opaque or even milky (Morgagni, Nasse), this appearance being due to an excessive amount of fat.

FATTY TISSUE.

There is a marked increase in the subcutaneous fat, in the fat between the muscles, about the different organs, especially the heart, kidneys, intestine, in the greater and lesser omenta, in the mesentery, etc. In the later stages of alcoholism, when the digestion becomes impaired and the blood deteriorated, this accumulation of fat disappears. According to Rokitansky there is an increase of fat in the marrow of the bones, the bony tissue at the same time being atrophied.

In the earlier stages of the affection the increase of fat is due to an infiltration rather than to a degeneration. The fatty liver, for instance, is of essentially a different nature at this time from that met with later on in the disease.

THE STOMACH AND INTESTINE.

A chronic catarrhal condition of the stomach is quite constant, and appears early in the disease. This is indicated by abundant soft gray mucus, projections of the mucous membrane, and by the slaty color that occurs, especially near the pylorus. Another form is very apt to be met with which is characterized by circumscribed hypertrophies of the whole mucous membrane (*gastritis prolifera*), and produces little warty projections (*gastritis verrucosa*); later, larger polypoid growths result (*gastritis polyposa*).[1]

Owing to the disturbance of circulation which takes place later in other organs, the return of blood from the stomach is interfered with, so that a varicose condition of some of the veins is produced.

The hypertrophy is very apt to be accompanied by dilatation of the glands, due to compression at their outlet, so that small cysts which are filled with a clear fluid and project from the surface result. According to Klebs[2] an inflammation of the submucous tissue may be produced by the excessive use of alcohol, and this go on to suppuration, or it may result in the formation of large masses of connective tissue without destruction of the mucous membrane. In this manner it occurs at the pyloric extremity, producing stenosis.[3]

[1] Orth, Diagnosis in Pathological Anatomy, page 285.
[2] Handbuch der Pathologischen Anatomie, S. 179.
[3] Birch-Hirschfeld, Lehrbuch der Pathologischen Anatomie, S. 831.

The continued irritation of the diseased mucous membrane is productive of a variety of ulcerations, from the small hæmorrhagic erosion, characterized by a superficial loss of substance, to the so-called round or perforating ulcer.[1]

According to Erbstein,[2] after administering large quantities of dilute alcohol to dogs for three or four days the peptic and ordinary gland cells of the stomach are found cloudy and granular. The lumen of the pyloric glands is plugged by a finely granular, yellowish or yellowish-brown mass. In extreme cases fat drops appear in the altered cells. In most cases chronic alcoholism produces no marked effect on the intestine, although in many a chronic catarrh exists.

THE LIVER.

The liver is the first and the most severely affected by the abuse of alcohol of all organs in the body. The alcohol being taken up by the portal system is carried directly to this organ, and there, by its irritating effect, produces various disorders according to the individual's condition, and more especially the character of the alcohol. The more concentrated the alcohol the sooner and the more severely is the liver affected.[3] Beer and wine seldom affect the liver, and are almost never productive of severe forms of degeneration.[4] The mos frequent affections of the liver produced by chronic alcoholism are simple fatty infiltration,[5] inflammation of the parenchyma, and fatty degeneration of the same,[6] and lastly inflammation and hyperplasia of the interstitial connective tissue.

Among the causes of fatty liver the abuse of alcohol is one of the most prominent. According to Frerichs it ranks only second, chronic disease of the lungs standing at the head of the list. He says: "Of thirteen individuals who died of delirium tremens, in six the liver was very fatty, in three the organ contained little fat, and in two none at all; lastly, two died of cirrhosis of the liver." It is probable, but not absolutely certain, that the alcohol acts by retarding the metamorphosis of tissue[7] and the blood being overcharged with fat deposits it in this organ.[8]

"In higher grades the liver is enlarged, but usually appears flattened, the edges are generally thickened and rounded off. The peritoneal covering of the liver is transparent, smooth, and shining. According to the grade of fatty infiltration the surface of the liver is yellowish red or distinctly yellow. The consistence of the organ is diminished; it feels doughy, and pits on pressure with the finger. On incision we meet little resistance; a coating of fat remains on the warmed knife blade. The cells in the periphery of the acini first become infiltrated, and later on those nearer the centre."[9] The quantity of blood

1 Klebs, Handbuch der Pathologischen Anatomie, S. 186.
2 Virchow's Archiv, Bd. 55, S. 469.
3 Frerichs, A Clinical Treatise on Diseases of the Liver, vol. ii., p. 33. Sydenham Trans.
4 Ibid.
5 Frerichs, A Clinical Treatise on Diseases of the Liver, vol. i., p. 299. Klebs, Handbuch der Pathologischen Anatomie, S. 382. Orth, Diagnosis in Pathological Anatomy, p. 318. Niemeyer, Text-book of Practical Medicine, vol. i., p. 656.
6 Klebs, Handbuch der Pathologischen Anatomie, S. 406.
7 Niemeyer, Text-book of Practical Medicine.
8 Baer, Alcohol.
9 Niemeyer, Text-book of Practical Medicine.

in the capillaries is diminished in proportion to the amount of infiltration.[1] On microscopic examination, according to the grade of the disease, the enlarged or usually rounded liver-cells appear filled with fine fat globules, or those have united to form single larger drops, or, lastly, individual liver-cells are entirely or mostly filled by one large drop of fat.[2]

Fatty or granular degeneration of the liver is attributed to the abuse of alcohol by Baer, who quotes Klebs in so doing. The reason why the latter assigns this as a cause is perhaps owing to the fact that he makes a somewhat different classification of the diseases of the liver, considering certain forms as degeneration which are looked upon by other authorities as simply infiltration. According to him the direct action of other toxic substances upon the liver, such as hydrocyanic acid, carbonic oxide, phosphorus, arsenic, and antimony produce this degeneration. Among the organic substances alcohol, ether, and chloroform hold an important position.

INTERSTITIAL HEPATITIS. CIRRHOSIS OF THE LIVER.

The most common cause of this form of interstitial hepatitis, which extends uniformly over the whole organ, is usually considered to be the intemperate use of alcohol, still this is not necessary; most drunkards do not have a cirrhotic, but a fatty liver, and many persons with cirrhosis are not in the habit of dram drinking.[3] Certainly cirrhosis is so commonly the result of the abuse of alcohol that when met with the cause may fairly be suspected.[4] Frerichs speaks of it as "the chief cause."

Birch-Hirschfeld says that it is doubtful if cirrhosis is ever due to any other cause. The volume of the liver is increased or diminished according to the stage of the process. It is only accidentally met with in the early stages. The principal change produced in the liver consists in an increase of the interlobular tissue, and the appearance of small grayish masses at the periphery of the lobules. The consistency of the liver is increased. The cause of this change consists of a growth of granulation tissue from Glisson's capsule, from which small projections extend into the acini. In the later stages of chronic interstitial inflammation the liver is more or less diminished in size, in rare cases fully one half; its surface is uneven and covered with prominences, which vary from a millet grain in size to that of a pea, and are usually of a yellow, icteric color. At the edge of the liver, especially in front where it is sharp, single nodules are frequently found, completely isolated, as the capsule belonging to the two surfaces comes in contact here. Upon section a similar condition of things is seen in the interior of the organ.

ORGANS OF RESPIRATION.

Drunkards are very subject to catarrh of the larynx,[5] which is often accompanied by a similar condition of the pharynx.[6] This catarrhal inflammation of the larynx not unfrequently extends into the bronchi.

[1] Baer, Alcohol. [2] Niemeyer, Text-book of Practical Medicine.

[3] Orth, Diagnosis in Pathological Anatomy. Frerichs, A Clinical Treatise on Diseases of the Liver. Niemeyer, Text-book of Practical Medicine.

[4] Baer, Alcohol.

[5] Baer, Alcohol. Niemeyer, Text-book of Practical Medicine.

[6] Niemeyer, Text-book of Practical Medicine.

A very important question is whether the habitual use of alcohol predisposes to disease of the lungs. Upon this point authorities differ so widely that it is quite impossible to draw any conclusion.

THE HEART.

In habitual drunkards the heart is almost always found hypertrophied. This hypertrophy may be brought about in various ways. As is well known, the effect of alcohol is to increase the frequency and force of the pulse. Whenever a muscle is called upon to do an extra amount of work the effect is to increase the size of that muscle. This hypertrophy of the ventricular walls, which is simply the result of an increased amount of work, is also produced by various obstructions to the circulation which the heart has to overcome. Owing to the deposit of fat in and about the different organs, to the fatty infiltration of the cardiac muscle itself, the work of the heart is increased. This will also be caused by the disturbance of the pulmonary circulation, owing to bronchial catarrh, emphysema, etc., and also to disturbance of the portal circulation from fatty liver, cirrhosis, etc. Another very important factor in the cause of hypertrophy of the cardiac muscle, and especially of the left ventricle, is, according to some authorities, the condition of the kidneys frequently met with in chronic alcoholism. Here one may find fatty degeneration of the parenchyma, accompanied by an increase of interstitial connective tissue which has become more or less shrunken. According to Traube this contraction cuts off a large number of small vessels, and results in an increase of pressure in the aortic system, producing dilatation and hypertrophy of the left ventricle. This explanation is objected to by others, for instance Bamberger. Still another obstruction to the circulation is owing to the lumen of the vessels being increased, for when this occurs the blood-stream is rendered slower, and has to be overcome by increased heart's action. Finally, an atheromatous condition of the arteries is to be mentioned, as this causes a decided obstruction.

In the later stages of alcoholism a fatty degeneration of the cardiac muscle occurs, and in the very last stages, owing to the general inanition at that time, the muscle becomes atrophied and diminished in weight. The organ is pale and flabby, diminished in size in all directions.

THE VESSELS.

The change in the capillaries consists in an increase in their lumen, that of the smaller and larger arteries in the so-called atheromatous degeneration. The dilatation of the small vessels and passive hyperæmia of all the organs has been explained on the ground that the alcohol has a paralyzing effect upon the vaso-motor system; also that the alcohol, by its irritating effect upon the walls of the vessels, causes a fatty degeneration of the same, and as a consequence a loss of tonicity.

Aside from the fatty condition a sclerosis of the walls takes place, owing to hyperplasia; this may result in the so-called ossification, an infiltration of lime salts into the newly formed tissue. As a result of these conditions the vessels lose their elasticity, becom hard and stiff, and thus are more resistant to the

flow of blood. This chronic inflammation of the walls of the vessels which underlies this process may be brought about by the continued use of alcohol. The irritation which alcohol produces in all the tissues may be sufficient to produce inflammation of the walls of the vessels. A still more important element in the causation is the constant stretching which the walls undergo and which predisposes them to the atheromatous change. Traube attributes this degeneration in alcoholism to this, and also to the diminishing of the rapidity of the blood-stream, which occurs at the same time. He says: "The worst of these cases occur in drunkards. It is not unlikely that the increased tension of the aortic system which is observed in drunkards, not only while they are under the immediate influence of liquor, is owing to a contraction of the smaller arteries, which results in an increased tension by interfering with the flow of blood from the aortic system. This being the case, the increased tension observed in the larger branches would be accompanied by a slowing of the blood-stream." The primary inflammatory condition may also be brought about by the overdistention of the smaller vessels, caused by the increased heart's action. When they have once lost their tonicity this increased action ceases. It is a well-established fact that as the quality of the blood becomes deteriorated, a condition which is a constant accompaniment of the general cachexia, the nutrition of the walls of the vessels is interfered with, and a fatty degeneration results.

AFFECTIONS OF THE URINARY ORGANS.

After each ingestion of alcohol the secretion of urine is increased, as a larger quantity of water is excreted with it.

The diseases of the kidneys which most frequently occur in drunkards, and especially in the latter stages of alcoholism, are the parenchymatous and interstitial or granular nephritis. This latter is divided into two stages, that of infiltration of cellular elements, and the other of connective tissue formation. At first the inflammatory process produces an active hyperæmia, with an exudation of fluid and white blood corpuscles into the interstitial connective tissue. This in turn is productive of anæmia, impaired nutrition of the renal epithelium, and granular degeneration of the same.

If this process advances to another stage there occurs either a hyperplasia of the interstitial connective tissue or, what is more frequent, a granular condition with atrophy. The cellular elements lying between the urinary tubules become converted into masses of connective tissue, which serve to obstruct the glomeruli and tubules. The increased blood pressure in the aorta induces hypertrophy of the left ventricle, and albumen appears in large quantity in the urine, which is increased in quantity, and of low specific gravity. According o all authorities the abuse of alcohol is one of the most common causes of the granular kidney According to Christison three fourths or four fifths of all cases of granular atrophy are induced by it.

THE NERVOUS SYSTEM.

The affections of the nervous system in drunkards are both numerous and important. No organ, with the exception, perhaps, of the liver, suffers so con-

stantly and from such a variety of lesions as the central nervous system. Many alterations in the functions are recognizable after death by a change in the tissues, but there are various affections, on the other hand, which point to a marked change in the cerebro-spinal system that cannot be detected. The very delicate and complicated structure of the nerves and ganglion cells require not only that their anatomical but also their chemical relations shall be preserved for the performance of their functions. Ever so slight a deviation in the nutritive processes produces a disproportionate disturbance in their functions; much greater than in any other tissues of the body.

THE BRAIN.

The calvarium is altered. It is increased in weight by hyperostosis and sclerosis, both the outer and inner table being thickened. The cancellated structure is more dense, owing to a concentric formation of bone about the Haversian canals. Upon the inner surface, the channels of the vessels are deeper than normal as well as the depressions for the pacchionian bodies.

There is an increase in the amount of blood in the brain owing to the abnormal action of the heart and fatty or atheromatous degeneration of the walls of the small vessels, or diminished nutrition of the same, which paralyzes them so that their lumen becomes increased, and hyperæmia results. In the earlier stages of alcoholism, where alcoholic excess is relatively frequent, this hyperæmia is more of an active process, which, in the later stages, assumes a passive character when obstruction to the circulation exists in other organs, as the liver, kidneys, lungs, etc.

CEREBRAL APOPLEXY.

An effusion of blood into the brain substance frequently occurs in drunkards. All conditions brought about by the intemperate use of alcohol which tend to produce cerebral hyperæmia favor, in a marked degree, the occurrence of either large or capillary effusions.

SEROUS APOPLEXY.

An acute or chronic serous effusion into the cavity of the skull, into the brain substance, or into the membranes of the brain, and into the cavity of the arachnoid, may result from the abuse of alcohol. This transudation occurs as a complication in other cerebral diseases, and in those troubles which tend to produce hyperæmia of this organ by mechanical stasis, as in diseases of the lungs and heart. It may also result from a very watery condition of the blood, such as occurs in Bright's disease. In alcoholism the blood is poor in plastic material, and as a consequence the transudation is favored. Either an acute or chronic collection of fluid in the ventricles of the brain is not an infrequent result of drunkenness.[1]

PACHYMENINGITIS INTERNA CHRONICA.

This inflammation of the inner surface of the dura mater consists at first of a very slight layer of fibrine on the surface of the dura, from which a thin

[1] Hasse, Krankheiten des Nervensystems. Handbuch des Spec. Pathol. und Therap., von R. Virchow, Band 4, S. 365.

layer of connective tissue is afterwards developed, which adheres to the surface of the membrane. A second and a third layer of inflammatory exudation is then formed, and so on until there are many layers. The dura mater thus becomes materially thickened. Each one of these layers is vascular, and occasionally one of these vessels ruptures, resulting in a hæmorrhage between two of the layers. That this affection is more liable to occur in the intemperate there can be but little doubt, although it has been but seldom produced in the lower animals even after long and continued administration of alcohol.

MEDICO-LEGAL RELATIONS OF INSANITY.[1]

BY MEDICAL EXAMINER IRA RUSSELL, M. D.

THE subject assigned me is one of great difficulty. Much has been written upon it by men of profound learning and superior ability, and the conclusions formed are matters of controversy. Some writers, like Ray, seem to make too much of unsoundness of mind as an excuse for crime, while others go to the opposite extreme, and make acts punishable that are due to disease. The great problems first encountered are, What is mind? and What constitutes insanity?

What is mind? Is it an independent entity, distinct from and existing separate from matter, or is it a function of the brain? We only know mind by its properties — thought, reason, love, hate, etc. We only know matter by *its* properties, such as extension, weight, etc. None of the properties of either are common to both. We see matter and mind existing together; we see matter without mind: hence we infer that, as mind and matter have no properties in common, mind can exist without or disconnected with matter. Assuming, then, that mind is an immaterial entity, can it be diseased? I quote some of the highest authorities upon this point. Dr. Forbes Winslow, the able editor of the *Psychological Journal* of London, says he has examined no less than ten thousand cases of insanity, reported by different authors, with a view to ascertain if there was physical disease as the basis of the trouble, and the result is perfectly satisfactory to him of the material cause of mental derangement. Yet he says, "I do not maintain that I am in a position to describe the peculiar and specific alterations which some allege to give origin to that derangement of the action of thought to which we apply the term insanity. Admitting such a discovery to be beyond the range of finite intelligence, it does not, in the slightest degree, militate against the material view just propounded." Dr. D. Meredith Reese thinks "the brain is now recognized as the organ or instrument of the mind, in every enlightened creed, either among jurists, theologians, or physicians. The mind sits enthroned in its immaterial majesty, employing the brain, and its continuous elongation in the nerves, not only in directing all the intellectual, moral, and instinctive faculties, but in the perception by the several senses, and in the mobility of the voluntary muscles, in obedience to the will, and in a subordinate way, by innervation; it may be regarded as enabling every organ and tissue in the human body to perform its destined function in conformity to the vital laws." Thus the ablest advocates of the doctrine that insanity depends always upon disease of the

[1] Read at the October meeting, 1882.

structure of the brain, or of some other part of the body, are unable to tell what or where it is.

On the other hand, difficulties of equal and perhaps greater magnitude stare those psychologists in the face who reject the material explanation, and thereby admit, if not squarely declare, that the immaterial, immortal essence of pure thought may be subject to disease. That this God-like principle is liable to become diseased, like the grosser parts of the singularly intricate combination we call the physical man, is not this contrary to our conception of that wonderful spirit that thinks within us? If the spiritual principle is subject to disease, why not to death, to complete destruction or dissolution, the natural result of disease? "How can that subtle, mental essence, which has neither members nor parts, be disordered? How can the immortal principle within us decay? It cannot be; disease, disorder, decay, all belong to the body, and to the body only; and consequently we must place the essential seat of insanity in the body, not the mind." It does not, however, follow conclusively that because mind is immaterial it cannot become diseased in itself, nor does this view render the immortality of the soul less probable and true. An able writer says, "It is not a purely corporeal disease, like one of the neuroses; it is not a nervous affection merely, but a neurosis and something more; neither is it purely a mental affection or disease. Both mind and body are at fault." According to the views of Feuchterleben, it is their *relation* that is diseased: of the body to the mind, so that perception is morbid; of the mind to the body, so that volition is disordered. From which, then, does that disturbed relation proceed which, when established, becomes reciprocal?

Perhaps I ought to say that, strictly speaking, insanity is not entirely due to a physical disease as its first cause. Purely mental disturbances are sometimes the cause upon which the physical disease which produces insanity depends. Granting that insanity is a physical disease, can it be defined? Is there a definition that will cover all its phenomena? I have seen no such definition; all attempts to define insanity have been faulty. There is no standard of health or disease; so gradually do they shade into each other, mental as well as physical, that the line between them is an imaginary one.

Who at the close of day can mark where daylight ends and darkness begins? Who can tell where a child passes the line of accountability? Where do virtue and vice shade into each other? Where is the boundary of courage and rashness, between prudence and cowardice, between frugality and avarice, liberality and profligacy? When any or all of these things can be done, then, and not till then, may insanity be defined and its boundaries established.

As medico-legal witnesses we have to trace the line which separates passion, the subtle and shifting transformations of wild, ungovernable, impetuous passion, from the excitement of mania; the nice and shadowy distinction which separates lunacy from malignity, madness from brutality, crime from alienation of mind, vice from mental derangement, and that between the delusions of the lunatic and the false reasoning and absurd conclusions of many sane persons. There are many cases of insanity so palpably plain as to admit of no doubt by either physician or layman, but there is a great variety of obscure cases

that require the closest scrutiny to arrive at a correct diagnosis. As Maudsley says, in a general way, we may arrange the manifold varieties of insanity into two great divisions, according to the presence or absence of palpable intellectual derangement. The first division will contain all those in whom is insanity of thought or insanity with delusions, intellectual insanity; the second division, all those cases in which, without delusions, there is insanity of feeling and action, and may be called affective or moral insanity. Guiteau, in my opinion, should be considered as belonging to the latter class. He committed an insane act; he was not laboring under any delusion; his plea of divine inspiration was not a delusion, it was a part of his religious belief.

In fact, this latter form is the most dangerous, as it displays itself in acts, and not in thoughts.

Of intellectual insanity there is a great variety. In some the delusions are general and embrace all the intellectual operations, and may be termed general mania. Then there is a large number in whom the insanity pertains to only one thing or subject, while upon all other subjects the intellect is clear. Medical literature is full of such cases, and every insane asylum has numerous illustrations. We have pyromania, kleptomania, etc., each of which has a symptomatology peculiar to itself.

The form of insanity known as general paresis, in its different stages, has many of the symptoms peculiar to the other forms of insanity. Perhaps the first symptom manifested will be some moral obliquity. A person of the strictest moral character, upright in all his transactions, when suffering from this form of insanity not unfrequently becomes grossly immoral and dishonest, and is arrested and punished, to the great chagrin of all his friends.

The disease has its regular course, and after passing through various phases ends in death.

Any one familiar with epilepsy has observed the mental condition that frequently precedes and follows the convulsive attack. The sufferer becomes violent and homicidal, and many of the most horrible murders are perpetrated while he is in this condition. There are cases of masked or abortive epilepsy, in which the convulsive paroxysm does not occur. The diseased action manifests itself in convulsion of *ideas*, not of muscles. Several very interesting cases of this kind have come under my observation. In one instance a person, after great mental and physical effort, would become suddenly excited, and abuse his most intimate friends with the most opprobrious language. The attack would pass off, and he would have but an imperfect recollection of what he had said or done. I have known cases where, when the paroxysm had passed, the patient would accuse others of having said to him what he had said to others.

This class of epileptics are always dangerous, and rendered more so from the fact that the paroxysms may occur at long intervals, and during the interim they are entirely harmless. Did time permit I could relate many instances of crime committed by persons suffering from the various forms of insanity, but I hasten to consider the question of responsibility.

It being admitted that a person committing a crime is suffering from some one of the various forms of insanity, to what extent should he be regarded as

responsible for his acts? The old English Common Law regarded everybody who knew the difference between right and wrong as responsible. Thus in the trial of Arnold — an undoubted lunatic — for shooting at Lord Onslow in 1729, Justice Tracey said, "It is not every kind of frantic humor or something unaccountable in a man's action that points him out to be such a madman as is exempted from punishment. It must be a man totally deprived of his understanding and memory, and who doth not know what he is doing no more than an infant, than a brute, than a wild beast." While the above rule was observed in relation to criminal acts, an entirely different one prevailed in relation to civil matters. Men who were not regarded capable of managing their affairs were held strictly responsible for all criminal acts. On the wild-beast test many insane persons have been executed in Great Britain, notably in the case of Bellingham, who was tried and executed for the murder of Spencer Percival in 1812. Although it was perfectly clear that he acted under the influence of an insane delusion, he was tried immediately, and executed without delay. Since then the rulings in the courts of England have been somewhat modified. In 1843 McNaughton was tried and acquitted of the murder of Mr. Drummond, whom he shot under the delusion that he was following him with evil intent and blasting his character.

Much popular alarm and indignation were caused by his acquittal. The House of Lords, participating in the general alarm, propounded several questions to the judges of the courts, to obtain from them an authoritative exposition of the law for the future guidance of courts. The judges ruled that to establish a defense on the ground of insanity it must be clearly proven that at the time of committing the act the party accused was laboring under such a defect of reason, from disease of mind, as not to know the nature and quality of the act he was committing; or, if he did know it, that he did not know he was doing what was wrong. Thus it will be seen that a knowledge of right and wrong is still the legal test for responsibility in Great Britain. To the medical man, acquainted with the protean forms of insanity, this test is far from being satisfactory. Go into any insane asylum and examine the cases of undoubted lunacy, and a large proportion of the inmates will be found to know, and, in a measure, to be influenced by their knowledge of, right and wrong. Many will do things because they know them to be wrong. The true test, in my judgment, should always be this: Is the criminal act the result of disease?

The rulings of the courts in this country are in advance of those in England. Chief Justice Bell, of New Hampshire, says "that a person to be punishable by law must have, in addition to a knowledge of right and wrong, sufficient mental power to control the sudden impulses of his own disordered mind. The power of controlling the thoughts being lost, the power of the will over the conduct may be equally lost." Chief Justice Perley instructed a jury to render a verdict of not guilty if the killing were the result of disease; "that neither delusion, nor knowledge of right and wrong, nor design, nor cunning in planning and executing the killing and in escaping or avoiding detection, nor ability to recognize acquaintances, or to labor, or transact business, or manage affairs, is, as a matter of law, a test of mental disease; but that all

symptoms and all tests of mental disease are purely matters of fact to be determined by the jury." Judge Doe, of New Hampshire, in a lengthy and able charge to the jury, too long for me to quote, says that the product of mental disease "is not a contract, a will, or a crime." I have under my care a patient, crafty, cunning, and treacherous. He is a graduate of Harvard College, has traveled abroad, can talk intelligently in regard to many things, art, poetry, etc., and is fully able to distinguish between right and wrong. He is under the constant watch and care of an attendant. He would not hesitate for a moment to kill his attendant or any one else, if by so doing he could accomplish some secret purpose. In law a person accused of crime has the benefit of a doubt as to whether he has committed that crime.

When the plea of insanity is urged in extenuation of crime, and there is a doubt about the sanity of the accused, it is allowed to have weight in six of the United States, while in the remainder the insanity must be proven. I know that there is a popular feeling that the plea of insanity is often a trumped-up one, and that there are physicians who, for a consideration, will testify that the accused is insane, and that many escape deserved punishment upon that plea. The popular indignation against Guiteau has done much to intensify that feeling. Leaving out the question of Guiteau's responsibility, who that is conversant with insanity doubts his unsoundness of mind? Occasionally cases occur like that of General Sickles, who was acquitted on the plea of insanity, when in reality it was the popular opinion that there was a justifiable cause for the crime that influenced the jury to acquit. Doubtless ten insane persons have been executed where one sane person has been acquitted on the plea of insanity. One of the reasons why there is so much skepticism about insanity in the popular mind, and among the general practitioners of medicine, is doubtless owing to the fact that the insane are mostly under the care of asylum physicians. Until recently students in medicine had but little instruction in psychological medicine. When the older members of this Society attended medical lectures, almost nothing was taught respecting insanity; and when we met with cases we sent them to the asylum for treatment, and that, in many instances, when they could have been better cared for at home. We sent them to asylums because they were insane, and we did not feel competent to treat them. It is much easier for an insane person to feign sanity than for a sane person to feign insanity. I might mention numerous cases to substantiate this statement.

The celebrated Erskine relates the following circumstance. "I well remember," says he, "examining for the greater part of a day, in this very place [the Court of King's Bench], an unfortunate gentleman, who had indicted a most affectionate brother, together with a keeper of a madhouse at Hoxton, for having imprisoned him as a lunatic, whilst, according to his evidence, he was in his perfect senses. I was, unfortunately, not instructed in what his lunacy consisted, although my instructions left me no doubt of the fact; but not having a clew, he completely foiled me in every attempt to expose his infirmity.

"You may believe that I left no means unemployed which long experience dictated, but without the smallest effect. The day was wasted, and the prosecutor, by the most affecting history of unmerited suffering, appeared to the

judge and jury, and to a humane English audience, as the victim of the most wanton and barbarous oppression. At last Dr. Sims came, who had been prevented by business from an earlier attendance; from him I soon learned that the very man whom I had been above an hour ineffectually examining, and with every possible effort which counsel are in the habit of exerting, believed himself to be the Lord and Saviour of mankind, not merely at the time of his confinement, which was alone necessary for my defense, but during the whole time he had been triumphing over every attempt to surprise him in the concealment of his disease. I then affected to lament the indecency of my ignorant examination, when he expressed his forgiveness, and said, with the utmost gravity and emphasis, in the face of the court, 'I am the *Christ*.' And so the case ended."

How are we to determine whether a person is insane or not? Is it by comparing one person with another, — the civilized man with the savage, the upright, conscientious man with thieves and pickpockets? The man must be compared with himself. Here is a middle-aged man, who, all his life, has maintained an unblemished reputation, — an earnest, conscientious, religious man. Perhaps he is detected in some immoral practices; he commits some dishonest act, entirely foreign to the whole tenor of his life. He is arrested and punished. To the world he appears perfectly sane, but the expert alienist sees the incipient signs of general paralysis of the insane, and predicts, with absolute certainty, the end. The localization of function, as taught by Ferrier and others, throws light on partial insanity. Here is a patient who talks incessantly. May we not infer, in such a case, that there is an irritative lesion of the oro-lingual region in the third frontal convolution? Another patient runs or walks continuously in a purposeless manner, and if held down in bed will continue to move his feet. In such a case may we not suppose there is irritation of the postero-parietal lobe of the brain, in which Ferrier has localized crural movements? Another is constantly swinging his arms; and may not this movement be due to irritation of the ascending and frontal gyri, in which the brachial and manual movements are localized?

In the same manner, may we not account for mental manifestations, — some one of the faculties of the mind being affected, while all others are intact? Take the case of the suicide: may it not be that that part of the brain which presides over the instinctive love of life is dormant? May we not also thus account for many cases of partial insanity? Be this as it may, to what extent shall the partially insane be held responsible for criminal acts? A patient of mine, a physician, had syphiliphobia without any sign or symptom of syphilis, and was pronounced free from the disease by several eminent syphilographers. While his mind was clear and reasoning correct upon any other subject, he deliberately formed the plan to take his own life and that of his wife and child, and would have accomplished his purpose had not his plans been frustrated. Had he committed this act, would it not have been in direct consequence of his disease? Should he have been held responsible for it?

To return to the epileptic. I once had under my care an epileptic, a young and interesting lady. She had a husband and child, and although she had formerly been an affectionate wife and mother she neglected every home duty,

assigning as a reason that she no longer cared for her family; in the mean time she endeavored, by various arts, to attract the admiration of the opposite sex. She could reason correctly upon many matters, but would any intelligent physician hold her responsible for this peculiarity that I have mentioned?

I might go on citing instances, but time will not permit. I will simply say that in my opinion the whole mental condition should be considered in deciding this important question of responsibility. A person may be rightly held responsible for all acts except those bearing upon some one point, and yet, from the condition of some part or function of the brain, be wholly irresponsible on this one point. I believe, then, that the mental condition of the partially insane should be carefully shown; and if the criminal act shall be proven to result from one or more delusions, then the person shall not be held responsible for such act, although sane in every other respect.

In conclusion, I would say that I deem it of the utmost importance that provision should be made for the care and custody of insane criminals. In no case should they be allowed to be at large; neither are they suitable subjects for insane asylums or the state prison.

REPORT OF THE EXECUTIVE BOARD

ON THE

WORK OF THE MEDICAL EXAMINERS FOR THE YEAR 1881.

In behalf of the Executive Board the following report is herewith presented: —

The first portion of the report, or general summary, is compiled from the annual returns (Form 1), of which thirty-six have been received for the year 1881.

The second portion, as in former years, is compiled from the reports of individual cases (Forms 2 and 3). These two summaries are not alike, since both are compilations of portions only of the year's work, and not of the whole, some medical examiners having failed to render annual returns, and a still larger number the reports of individual cases. For example: it will be noticed that in the general summary thirty-six examiners have made nine hundred and forty-five views, while the entire number of individual reports returned for the year is only three hundred and thirty-two, showing a greater delinquency in this direction than in any previous year.

GENERAL SUMMARY.

From the annual returns the following summary is compiled: —

(1.)	Total number of views made	945
(2.)	Total number of views followed by autopsies	179
(3.)	Total number of autopsies refused by authorities	1
(4.)	Total inquests held as above	189
(5.)	Total inquests at which medical examiner testified	103
(6.)	Total cases reported by medical examiners as probably resulting from violence, in which no inquest was held	16
(7.)	Deaths from natural causes	383
(8.)	Deaths from railroad accidents	124
(9.)	Deaths from other accidents	272
(10.)	Deaths from suicide	112
(11.)	Deaths from violence (the act of another)	66
(12.)	Deaths directly or indirectly the result of intemperance	160
(13.)	Prosecutions resulting	29
(14.)	Convictions resulting in cases now finished	12

The relative proportion of views to autopsies and inquests is as follows, the ratios for the period of four and a half years bearing a singular uniformity: —

Years	1877 Six months.	1878	1879	1880	1881
Views	443	828	770	935	945
Autopsies	116	196	182	182	179
Ratio of autopsies to views	26%	23%	23%	24%	19%
Inquests	99	172	151	197	189
Ratio of inquests to views	22%	20%	20%	21%	20%

The comparative statement of causes of deaths is as follows: —

Years	1877	1878	1879	1880	1881
Natural causes	23%	39%	38%	35%	40%
Railroad accidents	17	14	11	14	13
Other accidents	29	25	30	28	28
Suicide	16	11	16	12	12
Violence by another	11	8	7	11	7

SUMMARY OF INDIVIDUAL REPORTS.

Deaths by accident, as compiled from the individual reports of cases (Forms 2 and 3), were as follows: —

Railroad injuries	39
Drowning	38
Fall	20
Shooting	1
Falling body	1
Burns	4
Elevator accidents	4
Run over	1
Blows on head	1
Fracture of skull	1
Machinery	5
Punctured wound of back (accidental)	1
Entrance of air to circulation	1
Poisoning by opium	2
Poisoning by laudanum	2
Poisoning by carbolic acid	1
Poisoning by oil of bitter almonds	1
Asphyxia in lime-kiln	3
Asphyxia by illuminating gas	1
Asphyxia by smoke	2
Asphyxia by strangulation	2
Asphyxia by smothering	2
Explosion of chemical compounds	2

Deaths by violence (the act of another): —

By criminal abortion	7
By blows on head	2
By blows on abdomen	1
By shooting	1
By infanticide	2

Suicides: —

By shooting	12
By hanging	8
By drowning	8
By cutting throat	6

By leaping from a height	5
By leaping upon railroad	1
By starvation	1
By poisoning with Paris green	2
By poisoning with strychnia	1
By poisoning with laudanum	1
By poisoning with corrosive sublimate	1
By poisoning with arsenic	1
By poisoning with phosphorus	1
By poisoning with furniture polish [1]	1

Deaths from natural causes: —

Heart disease	42
Apoplexy	15
Alcoholism	15
Peritonitis	7
Diarrhœa	1
Intestinal hæmorrhage	1
Hæmorrhage into pancreas	1
Phthisis	5
Pneumonia	5
Bronchitis	2
Meningitis	5
Epilepsy	4
Cerebritis	1
Disease of brain	1
Convulsions	3
Bright's Disease	1
Strangulated hernia	1
Privation	2
Exposure to cold	2
Old age	1
Aneurism of aorta	1
Placenta prævia	1
Cause unknown	1

Infantile group from natural causes: —

Still-birth	11
Premature birth	4
Convulsions	1
Strangulation by cord	1
Difficult birth	1
Starvation	1
Neglect	1
Cause unknown	3

[1] Furniture polish, in this instance, a mixture of turpentine, alcohol, shellac, and dragon's blood. A large tumblerful was swallowed. Result, convulsions and death. No autopsy.

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REPORT OF A CASE OF MURDER.[1]

BY A. ELLIOT PAINE, M. D., MEDICAL EXAMINER.

On the morning of September 26, 1879, I was called to Bridgewater to view the body of a man found dead in his house. I drove down, and, with one of the selectmen of the town, went to the house and found the dead body of Justin L. Gunn lying on the floor of a small bedroom, about eight by ten feet. The body was face downwards, with shirt and drawers on, in a mass of dried blood. There was no carpet on the floor, the only furniture in the room being an old-fashioned corded bed. There was one window on the side of the room, near the foot of the bed, and a door just at the head of the bed; there was another door at the opposite side of the room. The bed was in the corner of the room, so that it came near the door; the foot of the bed was drawn away from the wall about twelve inches; the bedclothes were thrown backwards, and the front part of the bed was depressed, showing that some one had lain there; the pillow and depressed portion were saturated with blood; the head-board and the walls, ceiling, and door, were spattered with blood. On investigation I learned that the deceased and his son had been living in the place a few months, carrying on a farm; that both had their sprees, and quarreled often. The son had remarked he would "fix the old man some day." The neighbors had last seen the murdered man on the even ing of the 24th of September, about ten o'clock. He was then alone in the house. Nothing was seen of the father and son on the 25th, and it was supposed that they had gone away. On the morning of the 26th the neighbors noticed the cows had not been tied up, and were uneasy and noisy. The neighbors then looked around the premises; found the doors fastened. On looking into the bedroom window they saw the blood on the wall, and gave the alarm. In a sink in the room adjoining the bedroom, used as a sitting and dining room, there was a small cabinet in which papers, etc., were kept. It had been broken open, and near it was a large screw-driver with blood on it. I did not examine the body at my first visit, but locked the house, and left it in charge of a neighbor, and sent a telegram to the district attorney asking for detectives. I also learned that the son was seen on his way to the railroad station (about three miles from the place) on the morning of the 25th of September.

In the afternoon of the day of the view, after getting authority to make an autopsy, I went to the house accompanied by the district attorney, and with the assistance of Drs. Pratt and Sawyer I made a thorough examination.

[1] Read at the February meeting, 1883.

On the pillow were a few small pieces of bone and brain substance. On the mattress, between the head-board and pillow, was a piece of bone about half an inch wide and an inch long. Hanging to the outer head-post was a pair of trousers (or overalls); one leg was quite bloody, and sticking to the cloth was a piece of bone about one inch wide and an inch and a half long. The head of the body was just under the edge of the bed, with the legs extending to the wall; one leg was drawn partly up, and one arm was under the body. I turned the body over, and found the nose flattened. We then removed the body to another room, and made the autopsy with results as follows: —

External appearances. The head and upper part of body were covered with dry blood. There was a large wound on the right side of the head, above and in front of the right ear, measuring three and three quarters by two and a quarter inches; from this wound brain substance was protruding. Another wound in the right frontal region measured two inches in length, and extended across the forehead. There was also a triangular wound, three fourths of an inch long and one fourth of an inch wide, just above the right eyebrow. No other wounds were found on the body. Rigor mortis was well marked, as was the cadaveric lividity on the front of body.

Internal appearances. On turning back the scalp a blood-clot was found covering the whole right side of the head. Under the wounds were found fractures of the skull corresponding with the wounds. A number of loose pieces of bone were removed, one piece extending from lower part of large wound downwards, and in front of the right ear, measuring four and an eighth inches by one and a half inches. A fracture of the skull was found extending from the upper part of the large wound on the right side of the head towards the left ear, in a triangular shape, three and a half inches. On removing the skull the membranes were found destroyed under the large wound, and the whole right hemisphere was covered with a clot of blood The larger part of the right hemisphere was lacerated. The rest of the brain was normal.

There were old pleuritic adhesions of the right lung in its posterior portion, and of the left at the apex; otherwise the lungs were normal, as were all the other organs.

The cause of the death was thus determined to be a compound comminuted fracture of the skull, the result of violence. It was our opinion that the man was killed while lying on his left side in the bed; that he must have received a number of blows at the large wound to produce so much disorganization, and that the blows must have been given just as the assailant came through the door of the bedroom, and in all probability were made while the victim was asleep, there being no signs of a tussle.

Some three weeks after this the son was arrested, when he confessed that he killed his father. He said that on the night of the 24th of September he (the son) came home about half past ten or eleven o'clock. His father began scolding about some work; from words they came to blows; his father struck him with the screw-driver, and then went into the bedroom. The blow so angered him (the son) that he went to a back room and got a hatchet, and go-

ing into the bedroom, as his father was sitting on the edge of the bed, he concealed the hatchet, and as he passed he struck his father on the head twice or three times. The father fell over on the bed, and he did not strike him again. He saw what he had done, and threw the weapon into a pile of wood (where it was found by the officer), and broke open the cabinet expecting to find money. He then changed his clothes, taking about half an hour. He then left the house and went into the barn, where he slept over night. He drove the cows to pasture in the morning, and took the cars to Boston.

The case was tried at Plymouth in the spring of 1880. The son testified to the same facts as he had previously confessed. On cross-examination he said that his father was on the bed groaning when he left the house; that he did not put him on the floor. The medical expert for the defense said that the man could have lived as long as was testified, and had voluntary motion enough to throw himself out of bed. It is to be remembered that where the body lay in bed it was several inches lower than the edge, and the body was found with the head under the edge of the bed, and the trunk and feet away from it.

The government attorneys claimed that the man was killed in bed; that before leaving the house the son dragged him out of bed, and drew the foot of the bed out from the wall so that the body could not be seen from the windows, either at the foot of the bed or through one in the dining-room opposite the door in the bedroom (a table being in the way). The son was found guilty of murder in the second degree, and is now at Concord. He said, when sentence was passed, he preferred death, and as the officer left him a few minutes on the morning of his leaving the jail he cut his throat, making five cuts; being in too great haste he did a poor job.

SOME REMARKS UPON INFANTICIDE,

WITH REPORT OF A CASE OF INFANTICIDE BY DROWNING.[1]

BY J. G. PINKHAM, M. D., MEDICAL EXAMINER.

THE crime of infanticide appears to be relatively a very frequent one in Massachusetts. The following figures taken from the statistical reports annually published with our Transactions will substantiate this statement: —

Years.	Deaths reported as by Criminal Violence.	Deaths reported as by Infanticide.	Percentage of Deaths by Infanticide.
1878	30	2	6.6+
1879	21	7	33.3+
1880	17	7	41.1+
1881	13	2	15.3+
1882	23	11	47.8+
Total	104	29	27.8+

These figures are derived from the reports of individual cases alone, and represent, probably, less than one third the work of medical examiners throughout the State. But if the statistics were complete there is no reason to suppose that the percentage of cases of infanticide would be shown to be any less. It is safe to say that more than one quarter part of the cases of criminal violence that come under our official notice are those of infanticide. Yet prosecutions for the offense are very rare, and convictions still rarer. In a large number of cases the medical evidence that a crime has been committed is conclusive, and yet but little effort, or none at all, is made to bring the offenders to justice. The indifference of the community to this shocking crime is surprising. Let an adult or a child of larger growth be murdered, and an intense excitement is at once aroused. But if the victim be a helpless infant the utmost apathy prevails regarding the crime, — often sympathy for the criminal even in those cases, unhappily, not rare, in which the hand of a mother performs the cruel act. Many of you may recall the notorious case, so much talked about in the newspapers, of Lizzie Corcoran, who drowned her illegitimate child, a few days old, by throwing it into the dock at Lynn. The chain of evidence was complete, and, in fact, the crime was ultimately confessed, yet the case was never even tried, and the culprit got off scot-free.

[1] Read at the annual meeting, June 12, 1883.

The popular sentiment which places a low value upon infant life is in exact accord with that which looks upon pre-natal life as of no value whatever, and refuses to regard its destruction as a moral offense. It is probable that infanticide is made to appear more frequent of late than formerly by the operation of the law of medical examiners. Under the old system when the dead body of an infant was found it was usually viewed and ordered to be buried, no attempt being made to ascertain by an autopsy the cause of death. But the medical examiner, when called to view the body of an infant that appears to be in such a stage of development as to warrant the conclusion that it was viable, has but one course to pursue in the discharge of his duty, and that is to make an autopsy, and ascertain definitely whether the child were born alive or not, and, if it were, to determine the cause of death. The very fact that the body was cast out unburied is proof presumptive of violence, and compels this course of action. The medical examiner is not justified, under any circumstances, in regarding the life of the newly-born child as being of less consequence than that of an adult. In view of the great prevalence of infanticide it is, perhaps, incumbent upon us to give increased thought to a study of this crime in its medico-legal aspects. The work of the Society has been well begun by Dr. Abbott in his article on the Evidence of Still-birth, published in vol. i., No. 2, of our Transactions. A series of papers following it upon the various causes of death, natural and violent, in new-born children, including reports of cases, might be of great interest and value. As a slight contribution to the study of the subject I herewith report a case of infanticide by drowning.

On the 20th of December, 1882, shortly before noon, I was notified that the dead body of an infant had been found in a privy vault in the outskirts of the town. On my way to the place, I met the city marshal, who told me that he had removed the child from the vault, and was then taking it to the police station. He said also that an Irish servant girl, the supposed mother of the child, required medical attendance, and requested me to go on and render it. On my arrival at the house a few minutes later I found the girl sitting by the stove in the kitchen. Having put her to bed (she walked up stairs without difficulty), I delivered her of the placenta and membranes, which were lying loose in the vagina. The perinæum had been torn through nearly to the verge of the anus. On being questioned the girl said that she was unmarried; that she had left Ireland eight months previously, having become pregnant before she started; that since her arrival in this country she had been at domestic service, and had not informed any one of her condition; that when labor pains came on she excused herself from work by saying that she was ill, and went into the cellar, where the child was born at about nine o'clock; that shortly before the birth she had a desire to go to stool, and attempted to use a floor pail for that purpose; that the child was then born into the pail, and that she, thinking it was dead, carried it out, and threw it into the vault; that she then returned to the cellar, and washed the pail and the floor. At this point the affair was discovered by the family, who had watched her movements with some curiosity and suspicion.

The view of the body was held at the police station at three P. M. of the

same day, and the autopsy soon after. The body was found lying in a small box upon a piece of newspaper which appeared to be quite wet with some clear liquid. On taking the body up to place it upon a table a considerable quantity of watery froth ran from the nose and mouth. The following are the essential facts in the record of the autopsy: —

External examination. Body that of an apparently mature male infant recently born. Length 51.4 centimetres; weight 3670 grammes. Surface mostly clean, but presenting *vernix caseosa* in the usual places, and a few bloody patches. Skin red and firm. Head large, dark, with small *caput succedaneum.* Face congested. Eyes closed. Scalp covered with hair. Mouth open. Watery froth issuing from nose and mouth. Nails well developed. Testicle in scrotum. Umbilical cord fresh and bloodless, fourteen inches in length; end ragged. Two and one half inches from the end the cord is half cut or torn through. Meconium about anus. Abdomen distended. Chest full. Slight rigor mortis. Surface cold.

Internal examination. Section along median line. Diaphragm at level of sixth rib. Liver deeply congested. Both lungs expanded, completely filling the pleural cavities; light pink in color; somewhat congested. The trachea was ligated, and the lungs together with the heart and thymus gland removed. The whole mass floated in water high above surface. Lungs floated in sections. A slightly pinkish froth exuded from both lungs on section and pressure in abundance. The trachea and large bronchi were filled with this froth. Large veins distended with blood. Blood fluid; no clots anywhere. Meconium in large intestines. Small intestines distended with gas. In the stomach was a small amount of liquid, like water. Bladder contained urine normal in appearance. Other organs, so far as examined, were healthy in appearance.

The conclusions derived from the examination were: —

(1.) That the child was mature.

(2.) That it had been born alive a few hours before the autopsy.

(3.) That the cause of death was drowning.

The conclusions in regard to the maturity of the child and the time of the birth were established by the testimony of the mother as well as by the appearance presented by the body. If the mother left Ireland eight months previous to her confinement, and had then been pregnant long enough to become aware of it, she must have been at full term when the birth took place. It needs no argument to show that the child was born alive. The complete expansion of the lungs makes it certain that respiration was performed after the entire extrusion of the child from the body of the mother, and that therefore the child was born alive in the English sense. It can hardly be disputed, also, that the cause of death was drowning. No other theory would account for the presence of so large an amount of liquid and froth in the respiratory passages. This condition of things could only have been brought about by attempts to breathe under water. It is not to be expected that the signs of drowning in the case of new-born children will be precisely the same always as in case of adults. Those external appearances due directly to the submergence of the body are very likely to be absent. If Caspar's theory that the cutis anserina is due to mental shock is true, we should certainly never observe that. Neither should we

expect so much pallor after a moderately long submergence; for the natural baby red is not to be as easily driven away as is the lighter hue of older persons. No deductions can be drawn, moreover, from the dark hue of the face, for this may have been the result of prolonged pressure upon the head during the birth. In that group of appearances which result from the attempt to carry on the process of respiration under water the differences to be expected would be less; yet we should hardly look for the signs to exist in the same degree as in the case of adults. The more feeble the life the shorter and less vigorous the struggle of its possessor to preserve it. The case reported, if exceptional in this respect, proves that the child was unusually strong. I place little reliance upon the minor indications of drowning as shown by the autopsy, such as the presence of water in the stomach, the fluidity of the blood, the accumulation of blood on the venous side of the circulatory system, the congestion of the lungs, etc., for the presence of liquid and froth in the respiratory passages seems sufficient in itself to establish beyond question the cause of death. This being settled, the only question remaining to be considered was whether the drowning was accidental or not. There being good reason to suppose that the mother willfully destroyed her child, she was arrested on the charge of infanticide, bound over from the police court, indicted by the grand jury, and released on bail without a hearing from the superior court. At the preliminary hearing the attorney for the defense vaguely shadowed forth two theories to account for the death of the child: one, that the mother drowned it while laboring under puerperal mania; the other, that it was accidentally drowned in the liquor amnii during, or soon after, the birth.

The first theory is not one that would have much weight with medical men; for it is incredible that a woman should develop mania after her confinement just sufficient in degree and duration to allow her to destroy her child, and that she should become perfectly sane and well a few hours afterwards, so as to show no trace whatever of the malady. Her own story, told with the object of relieving herself from suspicion, would of itself effectually dispose of this theory. The second theory is much more plausible than the first; yet there are certain circumstances which make it clear to my mind that the child was willfully murdered. In the first place the quantity and quality of the liquid in the respiratory passages of the child prove that it was drowned, not in a small pool of the discharges, but in an abundance of water. The city marshal stated that the contents of the vault were frozen; that the surface of the child was moist and steaming, but not wet. That he took it out by the feet, head depending, — an act which would allow much of the liquid in the child to escape. Notwithstanding this, and the wetting of the paper in the bottom of the box during the journey to the City Hall, enough liquid remained to run in a stream from nose and mouth when the child was taken out and placed upon a table. Besides, the liquid was clear like water, presenting no traces of fæcal matter, blood, or slime. If the girl's statement was true, that the child was born while she was sitting over a pail, we are to believe either that there was water in the pail, and that the child fell at once into it and was drowned before it had time to cry or manifest to her other signs of life, or

that the breaking of the bag of waters furnished liquid enough, together with urine, etc., to drown the child. In the former case respiration must have been performed so as to completely expand the lungs in every part while the child was dropping through a space of a few inches at most. If the pail were half full of water the head would enter it at once. As the perinæum was ruptured, the extrusion of the child must have been sudden. It is not to be admitted that respiration could have been performed while the child's head was within the vagina, for the head was large, and the mother a primipara. Even if the head were extruded, and the body held back by the shoulders, attempts at respiration could only have imperfectly expanded the lungs at best. But the rupture of the perinæum makes it almost certain that this delay did not occur. We are then justified, I think, in concluding that the girl's statement was false. She could have invented such a story only with the purpose of covering up some offense of her own. Hence there is little doubt that the birth took place upon the cellar floor, and that the mother, after severing the cord with some rude instrument, deliberately drowned her child in a pail of water.

A STRANGE CASE.[1]

BY O. T. HOWE, M. D., MEDICAL EXAMINER.

On the evening of February 28th, a few minutes past nine, I was told that Charles Cate had shot himself in a room over the Pemberton Bank, in Lawrence, Mass. I immediately went there, and on entering the room found Cate lying on his back on the floor. He was still alive, but his pulse was feeble, and his respiration stertorous. I loosened his clothes, moved him into an easier position, and then examined his wounds. Prepossessed with the idea that he had shot himself, I made but a slight examination. I saw what I supposed to be the wounds of entrance and exit, the cuts on the scalp from the pistol butt, and concluded that a post mortem on the next day, — for the man was evidently dying, — would reveal the exact course of the bullet. The occupant of this room, Mrs. Anderson, was lying on her bed, disabled by injuries presently to be described.

I then turned to examine the room, the plan of which I have here. It was a large room, in the third story of the Pemberton Bank Building, with two windows looking out on Pemberton Street. The door leading into the entry was fitted with ground-glass panels, and had a spring lock. To the right of the door of entrance was a lounge. On the lounge, which was spattered with blood, Cate's overcoat was lying. On the wall above the lounge, about four feet from the floor, was a smear of blood about the size of a man's hand. The ceiling above the lounge was spattered with blood, as was also the door leading into Mr. Osgood's room, a few feet distant. The carpet where Cate was lying was soaked with blood, which flowed freely from his head. To the left of the door as you entered was a large closet. Near the entrance to the closet was a pail half full of dirty water, a pair of shoes and stockings, and a hop-bag. The floor was covered with blood, and blood was spattered over the door and over a chest of drawers which stood in the closet. The second drawer in this was partly drawn out, and through its side was a bullet hole. In the drawer was found a bullet which fitted the revolver. The other bullet was not discovered at this time. The revolver which had been taken from Cate was an old-fashioned 44 calibre Remington. Two barrels had been discharged, four remained loaded. It was covered with blood, and about the trigger several hairs could be detected. The chamber to the revolver, as I was informed by the officers, had been found lying on the bed.

To the left of the closet was a door leading into Mr. Coan's room. This door was found bolted on Mrs. Anderson's side. There were no marks of blood about the wood-work. Mrs. Anderson had been moved from the closet

[1] Read at the Annual Meeting, June 12, 1883.

to the bed. I next examined her wounds. There were one or more severe contused wounds of the scalp, and a bullet wound in the right leg. The ball had entered near the head of the tibia, and passed out about half-way down the calf of the leg.

At twenty-seven minutes past nine, or about forty minutes after the shooting, Cate died. I then took possession of his effects. The only thing of importance to this paper was a handful of caps in his vest pocket, which fitted the pistol. As I was searching him his nephew, Herbert Cate, told me that I should find a paper sewed in his vest lining which might be of importance. I ripped the vest and took out a sealed envelope, the contents of which proved to be some twenty grains of sulphate of morphia. The body was then given up to the undertaker. A closer examination of the closet the next morning disclosed the other bullet and an indentation in the wall where it had struck. On the ball were some fragments of woolen corresponding with Mrs. Anderson's skirt.

The autopsy was held the next day, seventeen and a half hours after death, Drs. Sargent, Dow, and Abbott assisting. The following is a condensed account of it:—

Rigor mortis well marked. The body was that of a strongly-built, well-developed man, about five feet nine inches in height, weighing about 165 pounds. The face was pale; eyes closed; pupils slightly dilated. The hair was matted with blood. On the right cheek, a little below and to the right of the eye, were two or three small ecchymoses. Above and to the right of the right eyebrow there was a shallow cut about half an inch long. On the right temple were two cuts about the same size and depth, and a triangular cut an inch long on one arm and half an inch on the other. Two inches above the right ear was a lacerated wound about two inches long by one broad, laying bare the skull. On the vertex were nine distinct cuts, each about three fourths of an inch long, slightly convex towards the face. These cuts were all separated from each other, covering a space of two and three fourths inches in length by two in breadth. Directly back of these cuts the skull was exposed for a space of three inches in length by two in breadth, the edges of the wound being much lacerated.

On removing the skull-cap, the dura mater was rather easily detached; the pia mater reddened and injected. The vessels on the surface of the brain were full of dark fluid blood. On removing the brain nearly a pint of dark fluid blood and serum escaped from the severed vessels. There was no fracture of the skull, and no extravasation of blood on the surface of the brain or into its substance. The brain was large and apparently healthy. Cut sections were made without noting anything abnormal.

Examination of the Thorax. The pericardium contained half an ounce of serous fluid. The right ventricle of the heart contained nearly a fluid-drachm of dark, partly fluid blood. The left ventricle contained somewhat less. The structure of the heart was healthy; its valves were normal. The left lung was somewhat darker than the right, and contained more blood. Both lungs were normal in consistency.

The stomach contained over a pint of gruel-like fluid, yellow in color, and

consisting of partly digested food, which gave off a somewhat sour smell. The mucous membrane was slightly injected. No evidence of disease or poisoning was observed.

All the other organs of the body were examined, and nothing sufficiently abnormal to have had any effect on the case was found. The anus was closed, and there was no sign of fæcal matter about it.

The opinion of the medical examiner and of the physicians present was that the man died from self-inflicted wounds, the direct cause of death being shock or concussion.

The only question I had to decide as medical examiner was the possibility or impossibility of the wounds being suicidal. Taken *per se*, it was of course more probable that they were homicidal, but the evidence was very strong against it. I will now proceed to consider the evidence on which the above opinion was founded, and I will begin with Mrs. Anderson's testimony, given as soon as she recovered sufficiently to speak: —

"On the evening of February 28th I left my store at about seven o'clock with a sick headache, to which I am subject. I went directly to my room, and got a bucket of water, and made a hop-bag. I was soaking my feet, with the hop-bag on my head, when some one rapped at the door. I said, 'Is that you, Will?' (meaning my brother). Cate then spoke, and I knew his voice. I told him to go away, but he forced the door open, and said, 'Why did n't you open the door?' I said, 'I don't want you here; go away.' Then he pulled the hop-bag off my head, and struck me with something, — I don't know what. I screamed, and ran into the closet, and he fired at me twice. I pulled the door to, and then I heard what I thought was the click of the pistol once or twice; then in a moment or two I looked out, and saw Cate pounding himself on the head with the pistol. Then I suppose I fainted."

This was Mrs. Anderson's testimony, which I am inclined to believe was the truth, but not the whole truth. Before showing how far it was corroborated it will be necessary to introduce the other witnesses.

As I have already stated, a door opened from Mrs. Anderson's room into Mr. Osgood's. In his room that evening were Mr. and Mrs. Osgood and a Mr. Fisk. On the other side was Mr. Coan's room, but this was unoccupied between the hours of seven and twenty minutes past nine. Both of these doors had shrunk, allowing sounds to pass through readily. On the floor above Mrs. Anderson's room there were a number of persons present that evening: Helen Claystone and her mother, Letty Savage, Mr. Worswick, Mr. Robinson, and some others. The other witnesses were the officers and parties on the street.

Mr. and Mrs. Osgood and Mr. Fisk gave testimony to this effect: —

About fifteen minutes after seven they heard Mrs. Anderson go into her room, and light her lamp. In a short time she came out, and went into the kitchen, which opens out of their room, and is used by all on the floor; she drew a bucket of water, and went back to her room. They heard nothing more until the rap on the door. They would naturally have heard any talking or unusual noise in Mrs. Anderson's room. About half past eight Mr. Osgood came out of his room, and went up stairs. He then saw Cate stand-

ing in front of Mrs. Anderson's door. He stayed up stairs a few moments, and when he returned Cate was still there. He went into his room, and immediately after a rap was heard on Mrs. Anderson's door. A woman's voice replied, and then the door was forced open. Voices were heard for a moment, then a blow and scream, then two pistol shots. Mrs. Osgood threw up the window, and called "Police!" Then sounds were heard which seemed like clicks or blows (the evidence as to this varied), then louder sounds like blows, then all was silent.

In a time long enough to run down a flight of stairs, Mr. Robinson appeared on the scene. He was immediately followed by Miss Claystone and Mr. Worswick. Mr. Robinson tried the door; it was locked; through the ground glass of the panel he saw a shadow cross the room towards the lounge, and the light went out. This was also witnessed by Mr. Colcord, who was just coming up the stairs, and by Miss Claystone in the entry. To Mr. Colcord it seemed as if the shadow was waving its hands. Mr. Worswick then ran down stairs for the officers, and the other three remained, watching the door. Within a time, variously estimated from two to ten minutes, but which careful sifting of the evidence brings down to not more than three or four minutes, three officers and Messrs. Trickey and Sweeny appeared on the scene. The officers burst open the door, and Cate was seen sitting on the lounge, with the revolver in his hand. As they entered Cate rose up, and was disarmed by the officers. He then fell back insensible. While this was taking place Mr. Sweeny stood in the doorway, so that no one could pass out; the room was dimly lighted from the hall and street lights. A lamp was soon brought, and a careful examination of the room made. Cate, his head and hands covered with blood, was laid on the floor. Mrs. Anderson was lifted from the closet floor, where she was sitting, and placed upon the bed. No third party, or any trace of a third party, was found in the room. The door leading into Coan's room was found bolted on Mrs. Anderson's side; Mrs. Osgood's door was also found locked. Mrs. Anderson then gave her testimony to the officers. The two bullets were both found, confirming her story that both shots were fired at her. The wounds on her head and on his might both have been given by blows from a revolver such as Cate held in his hand. The bucket of water, the shoes and stockings, the hop-bag, — these were all silent witnesses to the truth of her story. The sound of blows, the click of the pistol as it missed fire, — these were all confirmed by other parties.

From the time of the pistol shot, then, the door leading into the entry was watched; no one went out. Three or four minutes passed, and the officers broke in; no one went out. The room was searched; no third party was there. If any other person was concerned in the tragedy, he must have clubbed Cate fourteen or fifteen times after Cate had shot the woman; and these blows must have been given apparently without resistance on the part of Cate, who was a strong, powerful man, armed with a revolver. In some mysterious way, after the assault, the assassin had vanished.

Mrs. Anderson's room was in the third story, with the windows looking out on Pemberton Street. Mrs. Carlisle, who roomed across the street, at the sound of the pistol shot went to her window, and remained watching Mrs. Anderson's

room until the lights were brought. It was impossible for any one to have escaped that way. A door opened into Mrs. Osgood's room. But in the room were three parties, and between the door and doorpost paper had been packed to dull the sound; this was undisturbed.

A door opened into Mr. Coan's room, but he could swear that on that evening he left the door locked on his side, with the key in the lock, and found it so on his return. The door leading from his room into the entry was also locked, and the key in his pocket. The officers also testified that the door was found bolted on Mrs. Anderson's side. It was of course impossible that any one could have let himself out through this door, and then locked it on both sides. Mr. Robinson was the first person on the scene, and he had a key to the room; but we have the testimony of Miss Claystone and Mr. Worswick, that Mr. Robinson ran *down* the stairs just in front of them, and that certain of the occurrences in the room took place while they were all three watching.

So with any other party; the time was so short, and so many witnesses were around the door, that it would seem impossible for any one to have given Cate the injury and then escaped. The only way a person could have left the room by any human means was through Coan's room; and here the evidence, as I have stated, was very clear.

Mrs. Anderson's testimony, then, seems to be corroborated by both direct and circumstantial evidence. It would certainly be unnatural for a woman to entertain a gentleman in her room while engaged in washing her feet, as she evidently was. It would be impossible that she should invent a story as soon as she recovered from her faint which would bear the test of investigation, she at the time not being sure but that Cate might survive.

There is one point, however, where her story, to say the least, was incomplete. The night of the tragedy there was a masquerade ball in a hall not far from her room. As afterwards appeared, she had promised a young gentleman to go and dress him for the ball that evening. She did go, and, as he testifies, was in his room from a quarter before eight to a quarter past eight. This she does not allude to in her evidence. She must have gone to her room about fifteen minutes past seven, stayed there for half an hour or so, and then gone over to the hall, and returned about twenty minutes after eight. This circumstance, however, serves to give a possibly immediate motive for the attempted murder.

Cate was very jealous of Mrs. Anderson. That evening he was seen by Mr. Robinson between seven and eight o'clock to enter the Pemberton Bank Building and go up stairs. In about five minutes he came down and went away. It is very possible that he watched her, and saw that she went to the masquerade, and that this was the spark that lighted the conflagration. I would say here that there was not the slightest reason to suspect Mrs. Anderson and the young man of any intrigue, and it was easily proved that at the time of the shooting he was in Saunders' Hall. Once before, Cate had quarreled with Mrs. Anderson, and he had been put under bonds to keep the peace. At that time he had taken this same Remington revolver to Mr. Frost, a gunsmith, and had it put in repair. It was identified by Mr. Frost at the inquest.

Cate's friends for some time had had doubts of his sanity. A week before

the tragedy his nephew, Herbert Cate, warned him to keep away from Mrs. Anderson, or he would again be arrested. "Don't you fret," was his answer, "I shall never be taken alive;" and then he pointed out to him the package sewed in his vest, but without explaining what it was.

He was, then, a desperate, very probably insane man, wild at Mrs. Anderson's evident desire to get rid of him. I believe that, jealous on account of her visit to the masquerade, he returned to his room, got his pistol, and came back intending to kill Mrs. Anderson and then to commit suicide.

The whole story of the crime seems to point to insanity. He struck her over the head with a loaded pistol. He fired at her twice and missed with one barrel, although the weapon was used not more than three or four feet away. My theory is that he then tried to shoot himself, and that for some reason the pistol did not go off; that he then took out the chamber to see what the trouble was, and, hearing the door tried, in his confusion threw the chamber on the bed, walked across to the other side of the room, blew out the light, and then began striking himself on the head. The morphia in his vest he evidently meant as a last resort, should he be taken to the station house.

There are several circumstances connected with this case of a very mysterious nature. For example, why did not Cate shoot himself instead of pounding himself on the head? Why was the chamber out of the revolver? Why was the light out? Why did not Mrs. Anderson tell of going to the masquerade? These points I have indicated and tried to answer. Mr. Frost, the gunsmith, tested the revolver, and had no difficulty in firing it; he also testified that the chamber must have been taken out, and could not have fallen out; it was possible, he said, however, that it might have been jammed and had not revolved that night.

I now come to the more strictly medico-legal points of the paper: —

(1.) Did Cate die of the wounds received on the head, or were they only factors in a result due also to poison or existing disease? A thorough examination was made of the body, and no indication of disease or poison was found. That he had taken no irritant or specific irritant poison was evident. There was no pin-hole contraction of the pupil, no vomiting, no diarrhœa, no convulsions. No bottle or paper containing poison, or likely to have contained poison, was found on or about his person, except the package of morphia which was sewed in his vest. I believe he died of the wounds received, and of them alone.

(2.) What was the immediate cause of death? The autopsy revealed no extensive extravasation of blood on the surface or into the substance of the brain; there was no fracture of the skull; beyond congestion of the vessels of the brain there was almost nothing to show a cause of death.

Taylor says:[1] "Wounds of the head are dangerous in proportion as they affect the brain, and it is rare that a severe contused wound is unaccompanied by some injury to this organism. It is important to remember that neither compression nor physical injury to the brain is necessary to render concussion fatal; after death no particular morbid change may be discovered in the body." And again:[2] "Death may take place from the disturbance of the

[1] Medical Jurisprudence, page 341.
[2] Ibid., page 316.

function of any organ important to life without this being necessarily accompanied by a perceptible alteration of structure." The history of the case and the result of the autopsy establish to my satisfaction the fact that Cate died of shock or concussion. No one of the wounds, apparently, was severe enough to have caused immediate insensibility, yet taken together they produced the effect of one crushing blow. "It is a well-known medical fact" — here I quote again from Taylor — "that a number of injuries, each comparatively slight, are as capable of operating fatally as any single wound."

(3.) Could a man who had received fatal injuries on the head, of the character described, possess the power of locomotion, or would they necessarily be accompanied by immediate insensibility? Taylor says[1] that a man after a severe compound fracture of the skull may nevertheless be able to walk for some distance, and then fall dead; that severe injury to the head or great effusion of blood is not necessarily accompanied by immediate insensibility or loss of motion. So, also, Woodman and Tidy, in their work on Forensic Medicine, state that the symptoms of shock are usually immediate, but there may be an interval between the accident and the symptoms. In this case we may perhaps assume that the lighter blows were first delivered, and that only as the officers came up stairs and the increasing probability that he would be taken alive was forced upon him did he deliver the heavier and more fatal blows.

I think, then, we may say that, while it would be more natural to expect immediate insensibility, it is not impossible that the power of locomotion may remain for a brief period, and yet the patient die of shock.

(4.) Could the wounds on the head have been self-inflicted? The announcement of the result of the autopsy, that Cate had committed suicide, was received with considerable incredulity, not only by the laity, but also by some of the profession. Leaving out the evidence, however, there were some things in the character of the injuries themselves that looked like suicide. That the wounds were all either on or to the right of the median line looks as if they were given chiefly with the right hand of the person himself. The nine convex cuts, all crowded into a comparatively small place, show that the head must have been kept quiet while the blows were delivered. In any personal conflict it would be almost impossible that nine wounds should be received in a space of two square inches unless we assume that the receiver was insensible. Moreover, these wounds were all shallow, evidently given with feeble force, characteristic of suicidal rather than homicidal violence. "Contused wounds," says Taylor, "are rarely seen in cases of suicide, but there are exceptions to this remark. When persons laboring under insanity commit suicide they often inflict upon themselves wounds of an extraordinary kind, such as would at first view lead to the suspicion that they had been produced by the hand of a murderer. In one instance which is reported, a lunatic in committing suicide inflicted thirty wounds on the head." I think we can say, then, that it was perfectly possible that the wounds were self-inflicted, and yet in the death and in the whole story there remains sufficient mystery to make it what I have styled my paper, A Strange Case.

[1] Medical Jurisprudence, page 347.

A CASE OF DELAYED PUTREFACTION.[1]

BY W. H. TAYLOR, M. D., MEDICAL EXAMINER.

On Wednesday, May 2, 1883, I was requested by the district attorney to make an autopsy upon the body of M. B. A., a woman who was supposed to have come to her death by the administration and effects of poison. Briefly, the history was that she was subject to attacks of hysteria at times, particularly after overwork, and was accustomed to take fluid extract of skull-cap to relieve her "nervousness." Having such an attack about two weeks before her death, after a hard day's work, she took from her husband two thirds of a teaspoonful of a new bottle of skull-cap, procured at a reliable druggist's in New Bedford. Shortly after the dose she had a convulsion, and an hour subsequently a second convulsion. She had no convulsions after this, but gradually grew worse, and died on March 24th without remarkable symptoms supervening. Her attendants were of the homœopathic persuasion, and I am unable to obtain a coherent history from them. The consulting physician made some vague remarks about "trouble with the pneumogastric," from which I inferred that the respiration showed some abnormal qualities. He was, moreover, strongly of the opinion that the deceased had been poisoned, and named gelsemium as the agent employed. She had no marked dyspnœa, no marked pulse change, no vomiting, pain, or diarrhœa, and passed a good quantity of urine, in which no albumen had been discovered. The information derived from the attendants was sufficiently vague and inconclusive.

The husband of the deceased had never abused his wife, but had been on terms of intimacy with a woman living in the house. Nothing absolutely criminal had been seen, but on sundry occasions he had manifested a degree of affection for the lady's person which seemed ill adapted to his position as a married man.

The body lay in the house from the 24th to the 27th of March, and was then buried in a church-yard at the top of a high hill; consequently, at the time of my examination, it had been exposed to the influences of decay for forty days.

Owing to the notoriety of the case in the neighborhood, it was deemed best by the legal officers to conduct the examination by night, though I objected on the score of artificial light.

Arriving at the church-yard at nine o'clock, P. M., the body was exhumed and carried to a tomb in the vicinity. I noticed that the soil was dry, and a gravelly loam. The body was buried at a depth of five feet for the lowest point.

[1] Read at the October meeting, 1883.

The coffin was an ordinary wooden one, rosewood stained. The body being removed from the coffin, a feeble petroleum lantern was offered as my sole light, and the autopsy was commenced.

The body, which was that of a well-nourished woman of forty-two years, exhibited rigidity, strongly marked. The face was fresh in color, and the eyes were moderately sunken. After removal of the clothing, the abdominal walls gave a sound on percussion like a frozen body, and I remarked to the assistants that the body was frozen. An instant's reflection showed this to be impossible, as the ground at that level had been free from frost for a month. The entire integument presented a hard, tallowy feel, indenting on firm pressure, the indentations remaining, with no tendency to a return of the normal appearance. There were absolutely no indications of putrefaction to be seen externally, beyond the slight sunken appearance of the eyes above mentioned. The skin of the abdomen was as white and clear as in life, and the same remark would apply to the entire anterior aspect of the body. The back and the posterior aspect of the arms, forearms, thighs, legs, and neck were of a bright red color, entirely different from the usual post-mortem staining, and this color extended half-way up the lateral aspect of the body and limbs. The color was not that of a part reddened by inflammation, but a *bright* red, which perhaps would be described best by the word *brilliant.*

On making the usual median incision, the feel was that of cutting through soap or tallow; the margins of the cut had to be forcibly separated, and would then remain in the position placed without being influenced by gravity. The parts which seemed chiefly concerned in this abnormal state of affairs were the subcutaneous, fatty, and cellular tissues.

The abdominal cavity was perfectly dry. The omental fat presented the same characteristics as the subcutaneous. The viscera were as fresh as if the subject had died within a few hours; even the spleen was hard and firm. The liver was of normal size; its cut surface showed points of central congestion, with slight fatty change in the immediately adjacent cells. The kidneys exhibited a possibly slight diminution in the cortical substance, but there were no marked changes; their capsules were easily separable. The uterus and appendages, bladder and rectum, presented nothing noteworthy. The stomach contained an ounce of stained mucus; it was healthy as to its coats. The intestines were nearly empty; there was a small collection of ordinary-looking fæcal matter in the *caput coli* and for a few inches beyond.

The pleural cavities were nearly dry. The lungs were fresh, somewhat congested posteriorly, otherwise normal. The heart was collapsed and dry, about one fifth enlarged; its walls were flabby, and the muscular fibres were somewhat fatty under the microscope. The interior of the cavities was stained black by recent blood-clot, but no old clot was found. No conveniences were at hand for testing the valves, but they appeared normal.

The brain was slightly softened, but could be easily demonstrated; no abnormal appearances were found.

The spinal cord presented the same characteristics as the brain. It was somewhat stained by blood externally, probably from the position it sustained for so long a time after death.

The stomach, intestines, kidneys, a portion of the liver, and the spleen were taken, on the following day, to Boston, and examined for organic and inorganic poisons by Dr. Charles Harrington, who reported negatively as to both.

No odor of decomposition was evident about the body either before or after section. An odor was perceptible, but it was an animal odor, which resembled, but was not quite, a *urinous* smell. The fact that it was not disagreeable may be inferred, when I state that owing to the state of alarm which the grave-diggers were in, we could procure no water to wash our hands, and were obliged to ride fourteen miles home before we could remove the traces of the autopsy; during this time we noticed nothing of an odor worthy of remark. Coffins in the tomb where the autopsy was made contained three bodies, which had been there for periods varying from three weeks to three months, but there was no odor from these, and they appeared but little changed about the face.

The grave-digger stated that cases of adipocerous change were commonly found when bodies were removed from the church-yard after long periods of interment. Whether the influences which produced this change could have operated to preserve the subject of this paper or not is a matter, of course, beyond demonstration. The observation is noted for what it is worth.

Perhaps no question comes up more frequently, and is of more importance to the ends of justice as well as to the interests of a wrongfully-accused person, than that of the length of time which has elapsed since death. Data are numerous showing the extreme rapidity with which decomposition supervenes, but little can be found on the retardation of the putrefactive process beyond a few days. With a case of the character of the one reported here in mind, statements relating to the length of time which has elapsed since death, based upon the appearance of the body, would, perhaps, be less positive than has been hitherto too often the custom. When it is considered, in reviewing the case, that the body lay in an inhabited house for three days before burial, in cool, moist weather, without ice or any preservative thrown into the cavities (as I am informed by the undertaker), was subsequently encased in a thin board coffin and buried in loose, gravelly loam, free from frost, where it remained for thirty-seven days before exhumation, and then appeared fresh, with no color or odor of decomposition about it, I think it will be found sufficiently noteworthy to merit the attention of persons interested in forensic medicine.

REPORT OF THE EXECUTIVE BOARD

ON THE

WORK OF THE MEDICAL EXAMINERS FOR THE YEAR 1882.

THE report of the Executive Board for the year ending December 31, 1882, is herewith presented. In its general features this report does not differ from the reports of previous years. Thirty-eight members of the Society have sent in summaries of their work for the year. From these the following statistics are derived: —

Whole number of views	954
Number of views followed by autopsies	189
Number of autopsies refused by authorities	1
Number of inquests held on above	179
Inquests at which medical examiners testified	79
Cases reported by medical examiners as probably resulting from violence, in which no inquest was held	23
Number of deaths from natural causes	336
Number of deaths from railroad accidents	133
Number of deaths from other accidents	241
Number of deaths from suicide	117
Number of deaths from criminal violence	64
Number of deaths directly or indirectly the result of intemperance	128
Prosecutions resulting	17
Convictions in cases now finished	7

Two of the convictions resulted from cases begun in the previous year. The total number of convictions reported would seem to show a very meagre result from such a large amount of viewing and dissecting. It is probable, however, that many cases, like the two given above, are carried over into succeeding years, and do not appear at all in the reports, which in this respect, therefore, do not adequately represent the practical result of our work.

The relative proportion of autopsies and inquests to views for the period of five and a half years is as follows: —

Years.	1877 Six m.	1878.	1879.	1880.	1881.	1882.
Views	443	82	770	935	945	954
Autopsies	116	196	182	182	179	189
Ratio of autopsies to views	26%	23%	23%	24%	19%	20%
Inquests	99	172	151	197	189	179
Ratio of inquests to views	22%	20%	20%	21%	20%	19%

The following percentages show the relative frequency of the various causes of death for the same period: —

Years.	1877.	1878.	1879.	1880.	1881.	1882.
Natural causes	24%	40%	38%	35%	40%	38%
Railroad accidents	18	14	11	14	13	15
Other accidents	30	26	29	28	28	27
Suicide	16	11	15	12	12	13
Violence	12	9	7	11	7	7
	100	100	100	100	100	100

Reports of individual cases to the number of one hundred and sixty-three have been made. The causes of death have been given in tabular form in two hundred and seven other cases. From the three hundred and seventy cases thus reported the following tables have been compiled: —

CAUSES OF DEATH IN GROUPS.

	No.	Percentage.
Accidental	136	37%
Natural	160	43
Suicide	51	14
Violence	23	6

ACCIDENTAL CAUSES OF DEATH.

Railroad casualties	55
Drowning	31
Falls	18
Run over by wagon	9
Poisoning (Chloral, 3; Aconite, 1; Methylic alcohol, 1)	5
Falling bodies	3
Explosions	3
Machinery accidents	2
Blasting accidents	2
Suffocation	1
Caving of gravel bank	1
Shooting	1
Kicked by horse	1
Hæmorrhage (bite of tongue in fit)	1
Exposure	1
Burning	1
Over-exertion in jumping rope	1

NATURAL CAUSES OF DEATH.

Heart disease	46
Stillbirth	19
Premature birth	16
Alcoholism	15
Apoplexy	14
Unknown	11
Pneumonia	8
Peritonitis	6
Bronchitis	4

Pulmonary hæmorrhage	3
Meningitis	3
Old age	2
Congestion of brain	2
Aneurism	1
Cholera infantum	1
Cirrhosis of liver	1
Diarrhœa	1
Delirium tremens	1
Typhoid fever	1
Phthisis	1
Debility and exposure	1
Septicæmia	1
Marasmus	1
Poisoning [?] (habitual use of morphia)	1

DEATHS BY SUICIDE.

Drowning	10
Hanging	10
Cutting throat	6
Shooting	16
Poisoning (Arsenic, 2; Opium, 2; Illuminating gas, 2; Strychnine, 1; Chloral, 1)	8
Cutting arm	1

DEATHS BY CRIMINAL VIOLENCE.

Infanticide (Suffocation, 1; Neglect to tie funis, 1; Neglect in general, 2; Exposure, 2; Strangulation, 1; Blow on head, 1; Drowning, 1; Unknown method, 2)	11
Abortion	3
Blows	2
Pistol-shot wound of abdomen	1
Stabs (wounding carotid artery)	1
Incised wounds of neck	1
Incised wounds of vulva	1
Privation	1
Blows, kicks, or violent pressure on abdomen	2

The great falling off in the number of full reports of cases is very noticeable. The attempt of the Society to obtain and preserve in its archives complete records of all cases coming under the notice of its members has not proved a conspicuous success. Many of the reports thus far obtained are interesting and valuable; but a portion of them are so meagre in their details as to be practically worthless. It is obvious that the standard of the Society in this particular was set too high, and that the burden placed upon members by the requirements of the by-laws is greater than many of them are willing to bear. Two members of the Society report upwards of one third the total number of cases. The amount of simple clerical work, to say nothing of brain labor, involved in preparing complete histories of all these views and autopsies is something fearful to contemplate; while for those who have fifty or even thirty cases the task is no easy one if conscientiously and thoroughly performed. It is therefore thought best by the Executive Board to advise

that members be allowed to report their cases in tabular form, using blanks provided by the Society with headings like the following: —

(1.) Number of view.
(2.) Location of view.
(3.) Date of view.
(4.) Name of person viewed.
(5.) Age of person viewed.
(6.) Sex of person viewed.
(7.) Supposed date of death.
(8.) Cause of death in form of medico-legal diagnosis.
(9.) Autopsy.
(10.) Inquest.
(11.) Verdict.
(12.) Prosecution.
(13.) Conviction.
(14.) Remarks.

By making use of paper with fine rulings, and devoting several lines to each case, enough space will be obtained to state all the leading facts, — all certainly that are employed in preparing our annual reports. Every member is supposed to keep a careful record of all his cases; and if any have the time and feel willing to prepare copies of these records for the benefit of the Society, the Corresponding Secretary should stand ready hereafter, as in the past, to receive and file away in the usual manner all such reports. It is possible that medical examiners who are not members of the Society may, if appealed to, fill out the above-mentioned blank forms, and that with a little extra effort we may be able to obtain complete statistics for the whole State. The object to be attained is so desirable that it certainly seems worth our while to make the trial.

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THE EXTERNAL APPEARANCES OF PISTOL-SHOT WOUNDS.

BY D. B. N. FISH, M. D., MEDICAL EXAMINER.

As by far the greater number of gun-shot wounds that come to the notice of the medical examiner are those caused by pistols or revolvers, I shall confine myself almost exclusively to a consideration of the wounds made by these "weapons of luxury," as they have been so fitly termed.

I have drawn freely from the works of Casper, Ogston, Taylor, Woodman and Tidy, Hofmann, Briand and Chaudé, and others, at times even using their language without always indicating the source from which it is drawn.

When called to view the dead body of a person supposed to have come to his death from gun-shot wounds, many questions will present themselves to the medical examiner that may depend for their solution entirely upon the evidence found upon the body itself. He will have to decide whether the death has been accidental, homicidal, or suicidal. If homicidal, it may be important to determine at what distance, with what weapon, and from what direction the fatal shot has been fired.

The trajectory of the bullet through the organic tissues is subject to many and unforeseen variations; it may happen — as it has to so astute an observer as Casper — that the ball cannot be found even at the autopsy, and one may be forced to form an opinion from the external appearances alone of these pistol-shot wounds.

Let us remember at the outset that "death makes disappear many of the phenomena of color, and brings about a relaxation of the parts which may change the dimensions of the wounds, or the situation of the wounded organs."

These wounds, under the force of ever varying conditions, are very different in appearance and extent; their appearances are far from having an absolute value, and "their significance is largely dependent upon the experience and acuteness of the observer."

The resistance of the air, modified, perhaps, by prevailing winds, the difference in length and calibre of the barrel of the weapon, the difference in the quality of its workmanship and even in its condition by reason of proper care or the want of it, the quantity and quality of the powder used, the shape and weight of the missile, all tend to make the problems more difficult of solution.

The wound made by a ball penetrating the body may present an appearance like that of Braun's "cuts of a lancet," or his "mere scratch," which had healed by first intention; or like Hofmann's wound of the scalp, "so slight, that having escaped detection at the first examination, it was only re-

[1] Read at the meeting of February 6, 1884.

vealed at the autopsy;" it may be a smooth, round opening, — large or small, — an oval wound, or a valvular one; it may have a starred or a serrated outline, or may be irregular and torn, giving to an otherwise simple wound a frightful appearance.

"In general, a bullet preserving its integrity, impinging at ordinary range and at a right angle upon any portion of the body well covered with soft tissues and not unnaturally put upon the stretch, leaves, as it passes through the skin, an opening more or less regularly rounded in form, often, perhaps, a little less in diameter than the missile, with its edges inverted and livid in hue, due to the contusion and to the discoloration from the burned powder carried upon the missile. A cylindro-conoidal ball will probably cause an irregularly outlined opening either stellate or slit-like with serrated edges. If the ball has traversed the body, the wound of exit may closely resemble that of entrance, but is usually larger and more irregular, with everted edges, bearing few evidences of contusion, but often showing greater loss of substance." [1]

"The wound of entrance is large and irregular when a ball strikes near the extremity of its range."

When a spherical bullet is fired from some distance and has lost but little of its momentum it usually makes a round, well-defined opening, while a conical ball frequently causes a linear incision; this is true especially of revolver-shots, which may produce wounds, very insignificant, similar to knife-cuts. The aperture is made with comparatively little bruising or tearing, and the resilient tissues close upon its track.

As a rule the entrance will be round only when the ball strikes at right angles; it will be oval or valvular when it strikes obliquely, but it sometimes happens that a conical ball from an inferior weapon, even when fired at right angles to the body, strikes wholly or partly upon its side according to the distance from which it is fired, thus always making an oval wound. A revolver in my possession at any distance beyond eighteen inches throws a ball flat-wise; within this distance it strikes partly upon its side, never upon its apex.

"Fired at a moderate distance but so near as to traverse the body, the orifice of entrance will be well-defined, round, or oval according to circumstances, — the skin slightly depressed, — the edges presenting a faintly bruised appearance; but the surrounding parts are neither blackened nor burnt, and they do not present any marks of bleeding. In these cases the orifice of exit is large and irregular, the skin lacerated but free from any appearance of blackening or burning; it is generally three or four times as large as the entrance orifice." [2]

In regard to the comparative size of these wounds of entrance and exit various and contrary opinions have been held by both surgical and medico-legal writers. On the one hand we have Woodman and Tidy claiming that "the exit wound is invariably the larger," while Casper as positively asserts that "the *wound of exit* is always smaller than the *wound of entrance.*" It is probably safer to follow the middle path with those writers who teach that, in general: —

[1] Otis, Med. and Surg. Hist. War of Rebellion, Surg., vol. iii., p. 711.

[2] Taylor's Principles and Practice of Medical Jurisprudence, i., p. 685.

In shots fired from a distance the aperture of entrance will be the smaller. [As most gun-shot wounds observed by army surgeons are of this class, this may account for their unanimity of opinion that the orifice of entrance is the smaller.]

In shots from a short distance the two apertures will be alike.

In shots fired close to the body the wound of entrance will be the larger.

It must be remembered that these are general rules, subject to many modifications.

Wounds of entrance made by revolvers and pistols will be smaller than those made by weapons of larger calibre; they will also probably be smaller when made by the cylindro-conoidal bullet, now so commonly used, than when made by a spherical ball. Small pocket revolvers, says Hofmann, give rise when they wound the skull only to a small opening whence radiate cracks in different directions.

The bleeding is usually slight, and when it occurs it is more commonly observed from the orifice of exit than from that of entrance.

As a rule, the edges of the aperture of entrance will be inverted and those of exit everted, but Casper shows that this is not invariably so. He says: "If the part struck be very fat, the fat soon protrudes from the wound and it — the aperture of entrance — is found to have its edges swollen and anything but inverted. In other cases the putrefactive process causes the edges of both wounds — where two are present — to protrude, and so prevents their being recognized either as apertures of entrance or exit."

Hofmann says: "The assertion that the edges of the aperture of entrance are inverted and those of exit everted is correct in many cases, but not in all. In wounds from shots fired near by, the edges of the aperture of entrance are almost always everted when there happens to be bone beneath the wounded surface, because the gases of explosion are diffused between the skin and the bone beneath; the edges of the wound are crowded outward and may even be lacerated in this manner." [A statement which does not accord with my limited experience in such wounds.] "What proves this method of production of the ragged edges and rents," Hofmann goes on to say, "is this fact: that the edges of the aperture of entrance, whether this be irregular or rounded, are almost always undermined, and the subcutaneous tissues are blackened by powder to an extent corresponding to the parts undermined."

I hope to demonstrate further on that in pistol and revolver shots these gases of explosion, instead of passing with the ball through the skin, expend the greater part of their force upon the tissues at a point outside of the opening made by the ball. I can see that some particles of powder may cling to the ball and explode after passing through the skin. For, in firing a Colt's revolver at twenty-eight inches, several grains of powder passed, probably with the ball, through blotting paper, and sprinkled the ash, left after burning, around the hole made by the ball in a second sheet of paper which was placed four inches behind the first one.

Medical Examiner S. D. Presbrey has furnished me the following notes of an interesting case which appear to demonstrate this possibility more clearly than do my own experiments: "An old man loaded a 'cut-off' musket with

powder and shot, — both in large quantities, — put the muzzle to his stomach, and fired. The cotton shirt had a hole, with burned edges, irregularly circular, four inches in diameter. Next, a thick woolen shirt had a ragged hole about one inch in diameter. Some few shot-holes to be noticed about the edges of this hole; edges scorched, but not burned like cotton shirt. Next, a cotton-wool undershirt with a ragged hole similar to the one last described. Skin blackened with powder for a space of three inches square. In this blackened space were two *tears* through the skin, making together an opening somewhat like the letter T, its horizontal measuring two inches, its perpendicular, or rather, oblique, measuring one inch. The stomach with its appendages was hanging through a large hole in his back, blown out, apparently, by an explosion of powder within the body."

Here the burning powder had passed with the small shot through the cotton shirt, setting it on fire; through the other two shirts with little burning, — as woolen burns much less freely than cotton, — and then had exploded in part upon the body, leaving a blackened surface of larger dimensions than the opening made in the second and third shirts. It is probable that the remaining and by far the larger portion of the powder was carried within the body and caused the appearances of explosion.

Ogston says: "The edges of the entrance will be depressed and contused, the edges of the exit projecting and torn. The entrance will be dry and dark colored, the exit one raw and bloody. There will be loss of substance in the former case, but none in the latter."

The blackened and burned appearance of the edges of wounds of entrance has been variously explained. Otis, as already stated, ascribes it to the contusion and to the discoloration from the burned powder carried upon the missile. Taylor says it arises from the heat and flame of the gunpowder at the moment of explosion. Hofmann declares that it is due less to a burn than to a contusion and excoriation of the edges of the aperture of entrance, for it may be found, although less defined, in shots fired from a distance. Ogston asserts that it may result from a contusion of the wound causing an ecchymosis, or, when the piece is fired close by, from the burning of the powder.

On the other hand, Briand and Chaudé, alone of all the authorities consulted, speak of "the cauterization of the lips of the wound by the heated projectile." They quote Gosselin as describing "furrowed wounds, which present a surface, so to speak, cauterized by the projectile;" also, "cul-de-sac wounds — bleeding more freely, for the projectile, losing in proportion to its penetration of the tissues a notable amount of its momentum and heat, divides the tissues without cauterizing them." Such a heating of the projectile by the flame of the powder and by the friction of its passage seems impossible, as the time of exposure to such influences is too short. A rifle ball travels, on the average, about six hundred and sixty feet a second, and it takes only a few one hundredths of a second to burn over one hundred and fifty grains of powder. Capt. John E. Greer, now chief ordnance officer of the Department of Missouri, who was selected by the War Department, at the request of the Attorney General of New York, to make experiments in firing for use in the famous Billings murder trial in Saratoga County, has stated to me that at no

range is the bullet heated sufficiently to burn the skin. His experiments were made with rifles, carbines, and revolvers on paper and on glass. [We probably shall not err greatly if we continue to speak of "a dose of cold lead."] Ogston has said that "as the blackened and scorched appearance of the edges of the entrance wound may be caused in more than one way, its presence or absence has to be accounted for by the history of the case, and is not found to be invariable in its occurrence. Where, as is frequently the fact, the blackening is due to ecchymosis being produced, the production or non-production of this ecchymosis will account for the extent or absence of the blackening."

Dr. F. H. Hamilton relates the case of a soldier shot in the chest by a sentinel, in which the wound of exit was larger by one half than the wound of entrance, its edges not everted but looking discolored as though blackened by powder. This discoloration he found to be due to a slight extravasation of blood into the tissues under the skin.

"Small shot, fired at a distance," says Dr. Lachese, "of not over ten or twelve inches, may produce a round opening somewhat resembling that made by a bullet; from twelve to eighteen inches the opening was irregular and the borders were much lacerated; at thirty-six inches the central opening was entirely lost and the surface much covered with shot." Briand and Chaudé say small shot begin to scatter at thirteen inches, while Dr. Lowe is said to have fired a new gun with the result of a round aperture resembling that of a bullet at a much greater distance than that given by Dr. Lachese.

Grains of powder may act as projectiles when fired at short distances, even penetrating the organs which they reach.

The wadding of a gun, paper pellets, a ball of wax or cork, may make holes like shot or like a bullet when fired from a gun with a large charge of powder at a distance of two or three yards.

The explosion of powder alone, without ball or wadding, is capable of causing very serious wounds, especially when fired into the mouth. When wadding has been used in like circumstances, it is known to have caused extensive laceration of the soft parts with fracture of the bones of the face and the base of the skull. So a pistol fired close to the abdomen, without a ball, has produced a fatal wound from the entrance of wadding alone. A pistol, loaded with powder and ball, may be fired with the muzzle pressed closely against the flesh without the ball touching the body. The weapon will either burst or recoil, and the bullet drop to the ground, leaving only a contusion or a slightly contused wound, caused, not by the ball, but by the air within the weapon.

The aperture in the clothing made by the projectile is worthy of consideration. Dupuytren says it is always smaller than the ball; Taylor, that it is smaller when the clothing is of an elastic material. In comparing the size of the aperture and that of the ball, it must be remembered that the bullet may have struck upon its side and not upon its apex, also that the powder may have burned a portion of the clothing around the opening. Ogston says: "At the entrance of the ball, the tissue of whatever kind exhibits a more or less ragged and irregular opening along with loss of substance, while the injury to the stuff caused by the exit of the projectile is not so much a hole as a rent, either straight or shreddy, which will admit the tissue to be so re-

placed as readily to show that there has been no part of its texture destroyed or carried away. The opening made by the ball in entering is always smaller in the clothes than in the skin."

In firing at several thicknesses of cloth placed against a hard or a soft backing one may often get as many varieties of openings as there are layers of cloth.

Although foreign to the subject, it may be of interest to note the statement of Briand and Chaudé that "when the ball presses the clothing into the wound, taking several superimposed layers of clothing, we frequently find the layers in the inverse order in which we should expect them; for example, we find a shred of the shirt before that of the coat, which can be explained only by a rotary motion, if not forward at least laterally, of the projectile."

Before passing to the appearance of the powder marks, let me call your attention to the following facts: —

"Two wounds nearly in a line may both be wounds of entrance, made by two distinct balls, both of which have lodged."

"The wound of entrance and of exit may be side by side, as when the bullet has passed around the body, or there may be only one wound through which the bullet has entered and also escaped."

"A plurality of openings does not necessarily imply a plurality of bullets, for one bullet has been known to make five wounds, — two of entrance and three of exit."

When the weapon has been fired at a distance, for ordinary pistols or revolvers, of probably not more than twelve to fourteen inches, the hair and skin may be singed, burned, or blackened from the burning powder; and at a distance, even for the larger weapons of this class, of probably not over forty-eight inches, unburned and partly burned particles of powder may be imbedded in the flesh.

These powder marks may, within certain limits, aid in estimating the distance at which the pistol has been fired, and the position in which it has been held. In some cases they may even show, with some degree of certainty, whether the weapon has been fired by one's own hand or by the hand of another.

They arise from the smoke, from the heat and flame of the burning gases, from partly burned powder, from the residue or ash of the wholly burned powder, and from partly burned and unburned grains of powder driven into the tissues.

The larger the charge of powder, the longer the barrel of the weapon, and the more finished its workmanship, the more marked will be these appearances; but with a large calibre and short barrel the powder marks will cover a greater extent of surface. Pistols will show these markings and brandings of powder at greater distances than revolvers of the same calibre; for, having a continuous barrel, there is not that escape of the gases of explosion and of the unburned powder that occurs between the cylinder and the barrel of the revolver.

The most of my experiments have been made with revolvers, because it seems, in these days, when very fair revolvers can be bought for eighteen dol-

lars a dozen, that by far the greater part of the murders and suicides are committed with revolvers using metallic cartridges.

Before detailing my own experiments, let me call your attention to what has been said of these marks of powder by others.

"Dr. Dumesnil," I quote from Hofmann, "found, in firing at pieces of white kid, that at thirteen centimetres (five inches) the tattooing and even the burning produced by the powder will remain, easily to be shown even after washing. It is very probable it will most always be the same" — upon white kid I suppose him to mean — "at twenty centimetres (7.87 inches). At thirty centimetres (11.8 inches) the traces diminished considerably; they nearly disappear at fifty centimetres (19.7 inches); and at eighty centimetres (31.5 inches) hardly a trace is to be seen.

"What disappears in the first place — passing from near shots to those fired at a distance — is the immediate action of the gases of explosion, which, even at short distances, are absent, and this in proportion as the charge is smaller; sooner for revolvers than for pistols, sooner for pistols than for guns.

"Tourdes, with a holster pistol" [the French holster or cavalry pistol is said to be of .45 of an inch calibre] "set on fire a piece of paper at one half a metre (19.7 inches), and we have observed burning of hair from a revolver nine millimetres in diameter (.35 of an inch calibre) fired from a distance of ten to fifteen centimetres (four to six inches). He also found an incrustation of grains of powder from a holster pistol at two metres (78.5 inches); from a great American revolver at one and one half metres (fifty-nine inches); from an ordinary revolver at forty centimetres (15.7 inches)."

Briand and Chaudé say: "Powder blackens the surroundings of the wound to an extent of several centimetres, and grains of powder incrust themselves in the circumference of the wound. Powder driven from a barrel burns on leaving it at a distance equal to the length of the barrel of the weapon; the burning wad is carried much further."

My own experiments do not accord with this statement, as a cheap revolver, with a four-inch length of barrel and cylinder, calibre .32 long, will burn cotton-batting at a distance of seven and one half feet, the burned spots appearing at a little distance from the entrance of the ball. It will scorch cotton cloth at a distance of five feet; bibulous paper at six feet. In certain other experiments the paper was set on fire at three feet, and several grains of powder had penetrated six layers of the paper; at thirty inches two holes were burned through the six thicknesses.

A Colt's revolver, old style, .32 calibre, six-inch barrel, with thirteen grains of "Duck powder, No. 4," burned cotton-batting at a spot two and one half inches from the entrance of the ball at eight feet. At two feet the batting was all on fire. Fired at seven feet it burned two holes the size of the ball through tissue paper. These holes were at some distance from and above the opening made by the bullet.

Resuming the extract from Briand and Chaudé, — "Experiments made with a holster pistol fired at hair on a sheet of paper have shown, at one metre, the paper blackened by some grains of powder; some had penetrated the paper. The hair had no trace of burning. Contour of holes made by the

balls not blackened. At sixty-five to forty-eight centimetres (25.5 to 19 inches) the hair had not been burned nor the paper blackened at the entrance of the ball, but the black points and little holes made by the grains of powder were numerous. Ten shots at sixteen centimetres (6.3 inches), edges of hole extensively blackened to width of thirty-five to forty millimetres (1.38 to 1.57 inches). Several times the paper took fire. The hair always burned more or less completely."

Casper says: "These scorchings and brandings with powder only prove that the shot has not come from any great distance, that is, . . . from a distance not greater than from three to four feet."

The most explicit statement that I have seen appears in The New Dictionary of Medicine and Surgery, Paris, 1866, in which it is said that "The charring and burning of the vicinity of the wound, seen only at entrance, are always seen in shots at sixteen centimetres (6.3 inches); very nearly always from sixteen to thirty-two centimetres. Beyond this up to one metre there is no longer burning, but we may still find black grains incrusted around the wound. At sixteen centimetres paper takes fire frequently, hair always."

In regard to the blackening of the edges of the aperture of entrance in paper and cloth as well as in the flesh, experiment leads me to conclude that a part at least of this is due to the smut of the barrel — which even in the best revolvers becomes very great after repeated firing — and to the powder which clings to the ball because the latter is greased before firing. With a perfectly clean bullet fired from a clean and dry barrel the hole in the paper appeared free from any blackening; with a clean ball and an oiled but otherwise clean barrel there appeared slight smutting; with a greased ball, and especially after the piece had become foul, the blackening of the edges of the hole was very marked.

Nearly three years ago, while making some experiments in firing at short range, I noticed, in addition to the smutting of the paper by smoke, and to the marks of the partly burned and the unburned grains of powder distributed around the bullet hole, one spot, blacker and more burned than the rest. I found this was caused by the flame of the gases, by the burning powder, and by the residue, or ash, of the burned powder striking and resting upon this place. I also noticed that this burned and blackened spot held a most constant position directly above, or above and a little to one side of the bullet hole. Asking for the reason of this, I was told by an officer of the United States Ordnance Department that "as the velocity of the powder gases was greater than that of the ball, powder stains are found above rather than below the bullet hole." Thinking this might give some indication of the direction from which the shot was fired, I tried in later experiments to vary its position by firing at different angles, but with little or no effect.

Firing the pistol from either side, from above or from below the paper, the mark was still above the bullet hole, though its lower border sometimes came down to the level of the lower border of the opening made by the ball. After wasting much paper and ammunition it occurred to me to turn my pistol hammer down, that is, bottom side up. Now this spot appeared directly below the bullet hole, and I had a most pleasing solution of what had so long perplexed me.

I could put this spot on any spoke of the wheel of which the bullet hole represented the hub, simply by holding the pistol so that its hammer and sight were on a line with that spoke. Turning the pistol flat upon its side, with the hammer to the right, the spot appeared upon the right of the bullet hole; turning it hammer left, the mark was at the left of the hole.

The position of this burned, or burned and blackened, spot varying constantly and varying exactly as the top or hammer of the pistol is turned on the long axis of its barrel, is due neither to the kind of weapon nor to the kind of ammunition used. Over two hundred experiments with seventeen different pistols and revolvers — rifled and smooth-bore of various calibres — fired with "loose ammunition," that is, powder and ball separate, or with rim-fire or centre-fire metallic cartridges, have failed to show any deviation from this result. It is due solely to the recoil of the muzzle of the weapon in the direction of its sight. When this recoil is prevented by fixing the weapon firmly in a vise the bullet hole will appear at or near the centre of the spot instead of at one side of it. This is well shown by the results of some seventy-two experiments kindly made for me, with the permission of the commanding officer of the National Armory at Springfield, Mass., by Mr. J. F. Cranston, an expert at the Armory. Of the seventy-two shots with three different weapons thirty-six were made with the pistols in a vise; each pistol was fired in four positions of the hammer — up, down, to the right, and to the left — at ranges of four, ten, and twelve inches; in no case did the mark appear at one side of the bullet hole. Of the thirty-six shots with the three weapons held in the same positions as before, but held in the hand, at the same ranges, none that showed the mark plainly failed to show it at one side of the bullet hole and on a line with the hammer and sight.

It is barely possible that a pistol will be found in which the centre of gravity or of mass is so far forward on the line of its barrel that the recoil will be *downward* when held in the usual position for firing, but I am assured by gun dealers and manufacturers that, though rifles are sometimes so weighted at the muzzle, by brazing on a piece of iron, as to prevent the recoil upward, no pistols are made that do not thus recoil.

I have seen no allusion to the appearance and position of this spot in any work I have consulted, and have met no one who has ever noticed it.

I offer you, then, what I believe to be a new and almost infallible rule for determining the *position of the weapon:* —

Whenever this burned, or burned and smutted, spot is found, either upon the skin, the hair, or the clothing, at one side of the wound made by the bullet, by placing the muzzle of the weapon upon the wound so that the line of the hammer and sight will meet a line drawn from the centre of the wound through the centre of the spot of burning, or of burning and smutting, you will have the exact position of the weapon when it was fired. By position of the weapon, I do not mean the distance at which it was fired, nor its angle to the body; the latter does not seem to modify the rule I have given. As some revolvers of large calibre and short barrel will sometimes produce the greatest smutting opposite the point of greatest burning, the latter must be understood in such cases as the spot to which this rule is to be applied.

It will occur to you that there are many positions in which a suicide could not, or would not, hold a weapon for the purpose of shooting himself, because he could not hold it firmly enough to be sure of inflicting a mortal wound. If this *brand*, if I may so designate it, is found either upon the skin, the hair, or the clothing, showing one of these positions of the weapon impossible or improbable for a suicide, it is reasonably certain that the case is one of homicide and not of suicide. No suicide, for instance, would hold a pistol to either the side or back of his head with the hammer and sight pointing forward, or forward and downward, nor would he hold it to his heart with the hammer pointing downward and inward, or downward and outward; nor to his side pointing backward.

Moreover, if this *brand* is found in certain positions relative to the bullet wound, — such as forward and downward at the back of the head, or downward on the back, or downward and inward on the chest, — we may feel sure that the victim has not only been shot by another, but has been shot while lying down, or at least while in a reclining position; for no man who intends to shoot another holds his weapon upside down. While standing over the prostrate body he may easily fire so as to leave the *brand* of the powder upon any side of the bullet wound.

It is possible that in a struggle for the possession of a pistol it may be accidentally fired in one of these unnatural positions; but even then the very fact of its being held in such a position might be of importance in corroborating a claim that it was fired accidentally.

In testing for impossible or improbable positions of the weapon it should be cocked, as the hammer will thus interfere with positions that might otherwise appear possible.

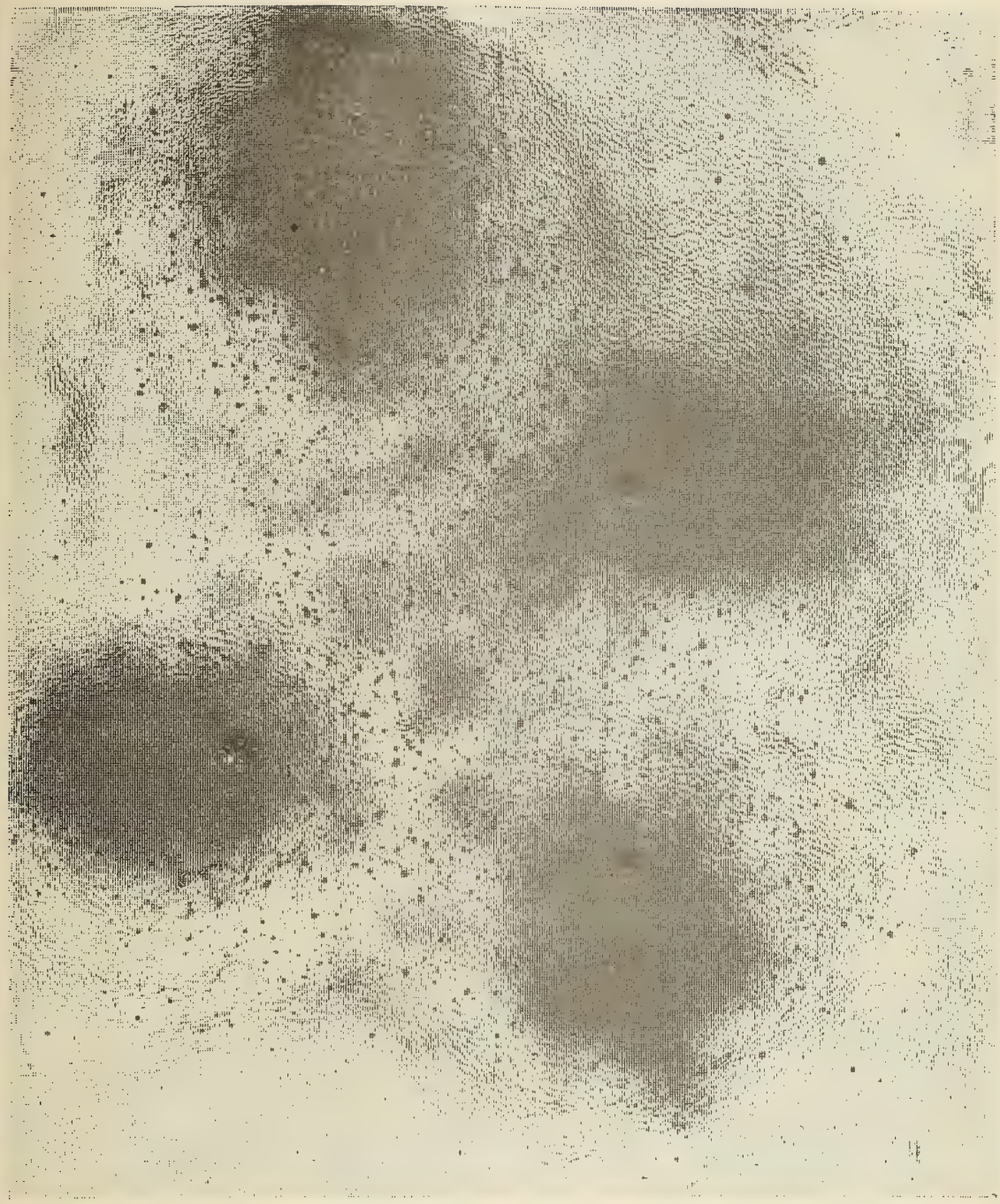
Let me say here that among the illustrations of the rule given some will be found which apparently do not exactly conform to the given position of the hammer; this is due solely to the fact that in firing at such short range it is difficult to hold the weapon in just the position intended on account of the great sense of danger to the eyes from the rebounding grains of powder.

For the better preservation of these illustrations Mr. Charles O. Lovell, of Lovell's Photographic Gallery, has generously enabled me to present herewith excellent photographs of some of the best of them.[1]

From the few experiments I have made, I believe that the statement already quoted that "the charring and burning of the vicinity of the wound are always seen in shots at sixteen centimetres (6.3 inches), very nearly always from sixteen to thirty-two centimetres," will be found true in the case of shots fired from revolvers and pistols. One of .22 of an inch calibre, short, will probably show the powder-brand plainly at four to six inches; a .32, short, at six to eight inches; a .38 at eight to ten inches; and a .44 at ten to twelve or thirteen inches. These figures are, of course, to be taken with a great deal of caution, as further observation may prove them to be erroneous.

As the distance of this *brand* — which always follows the line of the hammer and sight — from the entrance wound of the bullet will vary with the

[1] The illustrations which accompany this article are photographic reproductions of the original shots, reduced to one third of the full size.



This plate shows four shots made on dressed sheepskin from a Smith and Wesson new revolver, calibre 32, short, 6-inch range, with four positions of the hammer. The shot at the top was made with the hammer up, that at the bottom with the hammer down, those at the right and left sides with the hammer respectively right and left. Three fourths full size.

"kick" of the pistol and with the degree of firmness with which it is held, it is not probable that anything can be learned from this of the distance at which the shot has been fired. Neither have I been able, as yet, to draw any inference from the size of these powder marks as to the distance of the weapon.

Hair, unless it is wet or very oily, will show marks of burning at six inches with even the smaller revolvers and pistols; at eight to ten inches with a .38, and at twelve to thirteen inches with a long barreled .44 revolver.

The powder-marks upon the clothing will, by comparison with the results of experiments upon the same material made with the weapon and with ammunition similar to that used, furnish the criteria by which the distance may be judged.

I have found that upon broadcloth the spot or *brand* can be distinguished with care at fourteen inches with a .44 revolver; at nine to twelve inches with a short barreled .38; at eight inches with a .32 long; and at six to eight inches with a .22 and .32 short.

White flannel cloth will be scorched and singed so as to define the position of the hammer at twelve inches with a .32 long; at fourteen inches with the same weapon this could not be detected.

On cotton cloth at twelve inches with a Smith and Wesson .32 short, this powder-brand was plainly visible even after vigorous rubbing; with a Robin Hood, fired with a .32 short cartridge, the scorching and smutting were much less marked, the latter being an inferior weapon with corroded barrel. At fourteen inches, with a Colt's army .44, the *brand* was well defined.

It will be seen that I have placed the tissues upon which this powder-brand will appear in the following order: first — at the longest range — cotton and woolen cloth; next, the skin; and last, the hair. It is possible that when the skin is moist it may not show the *brand* even when the hair is burned.

Of the marks left by the powder upon the skin there remains for consideration the tattooing caused by the unburned particles of powder driven into the flesh. The proportion of powder wasted varies with the character of the weapon and with the kind of powder used; even in metallic cartridges of the same size it varies with the degree of compression used in fixing the ball. For heavy artillery this waste is over sixty per cent., and from my own experiments I know it to be very great with small arms, especially with the cheaper revolvers. In revolvers, a part of the unburned powder escapes between the cylinder and the barrel; in all fire-arms, a part of it may never reach the target; of that which does reach it, a part rebounds; how much will imbed itself in the skin is so much a matter of uncertainty that it is difficult to determine at what distance a given weapon will present a certain definite degree of tattooing of the skin.

After various and unsatisfactory experiments, none of which were upon the cadaver, I can do no better than to refer again to the statement found in The New Dictionary of Medicine and Surgery, that "beyond 32 centimetres (12.5 inches) up to one metre there is no longer burning, but we may still find black grains incrusted around the wound." Whether the tattooing of the skin can be produced at this distance by pistols and revolvers is not stated; it

seems to me very doubtful except in the case of the larger weapons of this class, having a long barrel and carrying a heavy charge of powder.

Neither can I give any definite estimate of the extent of surface covered by the tattooing at different distances. It is possible that in some cases an approximate estimate can be formed by experiments similar to the following made with a weapon with which a homicide had been committed:—

A boy was shot in the forehead with a "Standard" revolver, calibre .32 long. The tattooing measured two inches in diameter. The hair was considerably burned directly above the wound. Experiments with this pistol, and with cartridges similar to the one used, showed that to produce the amount of burning of the hair the weapon must have been held at a distance of six inches or less. Firing at two thicknesses of blotting paper placed upon a hard backing, as many grains of powder perforated the first layer of paper at six inches as at four inches, but to reduce the diameter of the surface perforated to the two inches of the tattooing of the skin the pistol had to be fired at a distance of four inches.

The fact that in very near shots clothing may be set on fire by the deflagration of the powder or by the burning wad is worthy of consideration.

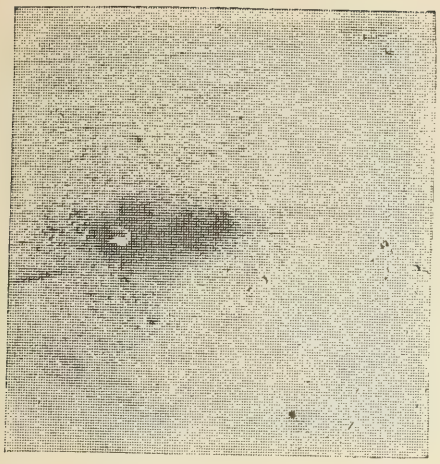
Ogston says: "As to the question of a fire-arm discharged close to the body setting fire to the clothes, and extending from this to any distance along the dress of the party, the French Academy decided after several experimental trials that though the clothing may be set on fire in this way, and the fire spread to a limited extent, yet the burning is usually confined to the borders of the orifice in the dress."

Briand and Chaudé state that "the burning clothing may burn the parts with which it is in contact, but the point of departure of the combustion is always upon one of the points of the circumference of the hole made by the ball. It will not burn to any great extent."

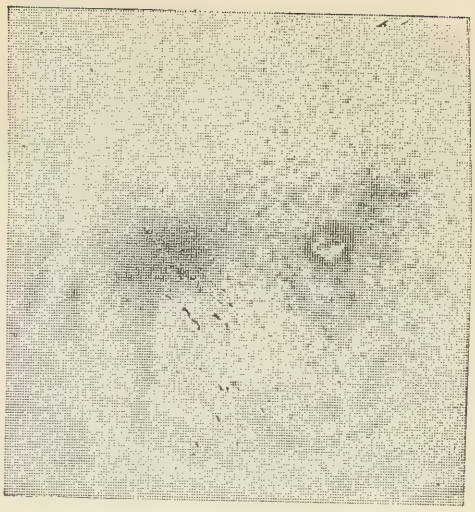
In my opinion it is safe to say that, usually, this combustion will start from that point at the edge of the hole in the clothing which is in a line with the hammer and sight of the weapon, although if this is below the entrance of the ball the greater amount of burning may be above, as the flame would naturally pass upward.

Experimenting upon a worn, light weight broadcloth coat, I have not been able to set it on fire at any range even up to two inches with a .38 revolver; at eight inches several fibres of a cotton pocket were burned in the track of the ball. At seven inches with a Robin Hood .32, the pocket was somewhat burned; at nine inches a .38 Union set on fire the padding of the coat in the track of the ball.

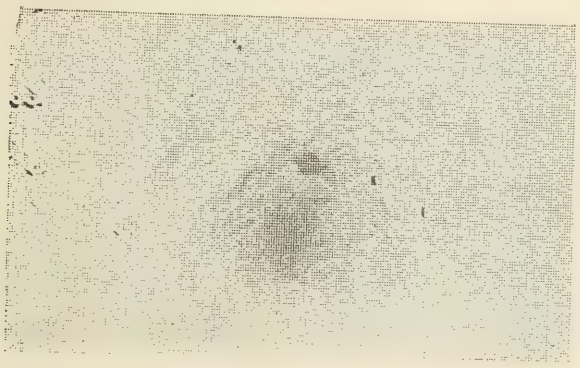
Firing at an old and well-worn box cover, which was stuffed with excelsior and cotton batting and covered with a sleazy curtain damask, a Hood .32, at twelve inches, charred the covering to an extent of half an inch in diameter about the bullet hole; at ten inches five holes were burned in the covering above the bullet hole; at nine inches cotton batting set on fire in the track of the ball; a Colt's .32, at nine inches, fired hammer up, with rifle powder, set fire to the cloth at the upper edge of the hole; this fire burned until it had to be put out to save the target; fired hammer down, it set fire to the lower edge;



Smith and Wesson 32, 6 in., hammer right.
(On chamois skin.)



Union 38, 6 in. range, hammer left.
(On chamois skin.)



Smith and Wesson 32, 8 in., hammer down.
(On chamois skin.)

Union 38, 36 inch range.
(On blotting paper.)

at eight inches neither Smith and Wesson's revolver, .22, nor Stevens' pistol, same calibre, produced any burning; at seven inches the Hood, and at five inches the Smith and Wesson's, .22, would always start a vigorous fire.

Such a target as this will give a fine illustration of the fact that the greater part of the flame follows the line of the hammer and sight. After exposing the cotton batting by making an opening in the cloth covering, and then firing shots about the circumference of this opening, with the sight pointed towards it, one can see the burning powder strike in the opening and set fire to the batting, while if the sight is turned away from the opening the flame will very rarely touch it.

In experiments on cotton cloth, at ten inches, with a Hood, .32 short, powder passed with the ball through four thicknesses of cloth, and set fire to the cotton batting in the box cover. At five inches a Whitney, .32 long, set the edge of the hole on fire. A Smith and Wesson, .32 short, set the cloth on fire, and burned a hole six inches in diameter.

Flannel did not burn at five inches.

It has been said that a pistol fired into the mouth has set fire to the portion of the clothing touching the neck, and burned the neck, chest, and chin. The fire extended to the furniture of the room. Such a burning, starting from a point below the entrance of the bullet, would seem very improbable, and would lead to the suspicion that the fire originated from some source other than the discharge of the weapon.

Devergie has stated that at 2.25 inches the shot can set fire to the clothing at the level of the hole made by the bullet, and the combustion may spread to a certain extent.

How shall we decide from these traces left by the projectile and by the powder upon the body and upon the clothing whether death has resulted from accident, from suicide, or from homicide?

It will not be necessary to recapitulate the evidences left by the projectile.

Accidental pistol-shot wounds cannot be distinguished from homicidal wounds when both are inflicted from a distance. In shots fired near by, when one is known to have been shot by another, and to have been shot while standing, an unnatural position of the weapon, as shown by the relative location of the *brand*, will tend to corroborate a claim of accidental shooting. So if one is known to have shot himself, an unnatural position of the weapon will show that the shot was probably accidental. The location of the wound and the course taken by the ball may also characterize the wound as accidental.

Homicidal wounds may be far or near, and will be determined by the exclusion of accident or suicide. If there are several wounds upon the body, the case is probably one of murder; but both barrels of a two-barreled pistol, or even more barrels of a revolver, may be accidentally discharged at the same time. One bullet, as has been said, may make five wounds, and a would-be suicide has been known to fire five shots into his own body. Suicides generally shoot at the head, — often directing the pistol into the mouth, — less frequently at the heart or lungs, more rarely at the abdomen; yet they sometimes fire at the back of the head. "The murderer more often, unless furious with passion, fires at the back or side of his victim."

If the wound be upon such a part of the body that a suicide would not be likely to inflict it upon himself, or if, as has been stated, the relative location of the aperture of the bullet to the burning of the hair, or of the burning, or burning and blackening, of the skin or of the clothing, shows that the pistol has been held in a position unnatural for a suicide, it is probable that a homicide has been committed.

If there is entire absence of these scorchings and brandings of powder it will also generally prove that the case is homicidal; but it must be remembered that suicides sometimes arrange contrivances, by means of cords attached to the trigger of the weapon, for shooting themselves from a distance, and that certain "chemical powders" do not leave any stains of the powder.

Casper relates the case of a man who undoubtedly shot himself through the heart, but not a single grain of powder was found on the edges of the wound, the neck, or the face. A like instance has come under my own observation in which a suicide held a pistol, loaded with the ordinary metallic cartridge, so closely to the temple that the blood spurted into the barrel of the weapon, yet there was only the burning of the hair, and a stain of powder smoke just back of the wound, an illustration of the rule already given governing the location of the powder brand.

Briand and Chaudé say that in the case of a suicide by a revolver it is very rare that the muzzle of the weapon, directed towards the head, can be more than twenty centimetres (7.87 inches) distant. Though this distance can be easily increased to even twelve inches by any one with average length of the arms, yet just as the suicide would not hold a pistol in any unnatural position of the hammer and sight of the weapon lest he should fail to inflict a mortal wound, so he will not be likely to exceed this limit of twenty centimetres.

If the bullet is found, its weight should be ascertained, as thereby it may be possible to show that although deprived of a part of its substance it still weighs more than the ball apparently used.

The external appearances of every pistol-shot wound should be studied with care. Then by experiments with the same weapon, and with ammunition similar to that used, it may be possible to determine many points otherwise doubtful, but of vital importance.

I do not know of any substance that has been proved to offer resistance to the impact of powder similar to that presented by the living human skin, and I am forced to leave this for some more fortunate member of our Society to discover. I will, however, venture the opinion that we have in blotting paper, of average thickness, a material of value for comparative experiments. With a target of two thicknesses of this fastened against a board, the surface covered by projections or elevations and perforations appearing upon the posterior surface of the outer sheet, will, I am inclined to believe, show the extent of surface marked upon the skin by powder grains when fired from the same distance. It may also be found that the number of these projections or elevations, together with the number of these perforations, will be equal to the number of grains of powder imbedded in the skin.

My experiments have been made upon sheep skin, chamois skin, upon the

skin of a young calf, and upon the skin of a living cat; also upon blotting paper of various thicknesses, rubber, cotton and woolen cloth.

SUMMARY. The *distance* at which a pistol-shot has been fired may be estimated by the following general rules: —

(1.) From a great distance the entrance wound will usually be large and irregular; there will be absence of any great degree of lividity of its edges, and absence of the marks of powder. The wound of exit, if one is present, will usually be larger than the wound of entrance. At any distance the edges of wounds of entrance will usually be inverted, those of exit everted.

(2.) From a short distance the entrance and exit wounds will generally be nearly equal in size; the edges of the former will be blackened, and powder grains will be imbedded in the skin, but there will be absence of the scorchings and brandings of powder.

(3.) Close to the body the entrance wound will generally be larger than the exit. There will often be, in addition to the tattooing of the skin by unburned grains of powder, a mark or *brand* made by the flame of the gases and of the burning powder, by the soot of the partly burned powder, and by the residue or ash of the wholly burned powder. As a rule this *brand*, which may consist of a burning alone of the hair, the skin, or the clothing, or of a burning and blackening of the skin or clothing, will appear at one side of the bullet hole.

The *direction* of a shot will be shown in part by the trajectory of the ball, — a subject of which this paper does not treat, — and by the location of the wound of entrance. The character of the opening, whether rounded or oval, may give some indication of the angle at which the weapon has been held.

The *position of the weapon* (and whenever this term is used I wish to be understood to mean not its angle to or distance from the body, but the manner or position in which it is held; that is, whether it is held with its hammer and sight above the barrel, as in the usual position for firing, or with the hammer and sight below the barrel, as when the weapon is turned upside down, or in any other position of the hammer and sight relative to the barrel of the weapon) the *position of the weapon* is to be determined by the following rule: When the *brand* appears upon the hair, the skin, or the clothing at one side of the bullet hole, hold the weapon with its muzzle to the bullet hole so that the line of its hammer and sight will meet a line drawn from the centre of the bullet hole through the centre of the *brand*, and it will show the exact position of the weapon when fired.

This rule is deduced from the newly-discovered fact that, owing to the recoil of the muzzle of the weapon in the direction of its sight, this *brand*, when it appears at one side of the bullet hole, will appear upon that side which corresponds to the side of the hammer and sight in their position relative to the bore or barrel of the weapon. That is, if the weapon is held upside down the *brand* will appear below the bullet hole.

Accidental wounds are generally near wounds. When inflicted from a distance they cannot be distinguished from homicidal wounds. In shots fired near by, when a person is known to have been shot while standing, an unnatural position of the weapon, as shown by the location of the *brand*, will tend

to corroborate a claim of accidental shooting. So, if one is known to have shot himself, an unnatural position of the weapon will show that the shot was probably accidental. The location of the wound and the course taken by the ball may also characterize the wound as accidental.

Homicidal wounds inflicted within the suicide limit have heretofore been distinguished from suicidal wounds alone by the location of the wound and by the uncertain evidence presented by the trajectory of the ball. When the location of the wound has been such that a person might easily have inflicted it upon himself there have been no means of determining from its character whether it was homicidal or suicidal. To aid in distinguishing between such wounds I offer the following rule: When the location of the *brand*, relative to the bullet hole, shows that the weapon has been held in a position of its hammer and sight impossible or improbable for a suicide it is probable that a murder has been committed. Certain relative locations of this *brand* may also indicate that the victim has been shot while in a reclining position.

Multiple wounds are usually homicidal, but may be either accidental or suicidal.

Shots fired beyond the usual suicide limit are probably homicidal.

Suicidal wounds. It is said that the suicide rarely holds the muzzle of his pistol at more than eight inches from the body. Suicides generally fire at the side or front of the head, next at the heart; they sometimes fire at the back of the head.

The distance from the body at which the weapon must be held to show the *brand* plainly is probably very nearly as follows: for small pistols and revolvers not over four to six inches; for large weapons of this class not over twelve to fourteen inches.

A FEW MEDICO-LEGAL FEATURES OF LIFE INSURANCE.[1]

BY MAX F. ELLER, ESQ.,

Associate Member.

THE beneficent institution of life insurance has, in proportion to its extent, perhaps more than anything else, been a fruitful source of litigation. With the exception of criminal law, there is no branch of legal science, both theoretical and practical, which presents so many features of medico-legal interest and which has contributed in such a marked degree to the study, investigation, and judicial settlement of controversies, largely based upon difficult or doubtful problems of forensic medicine. The reasons for this are not far to seek. The physical condition of the applicant for life insurance at and prior to the time of his application, his mode of life, his habits, his family history, the remote and proximate cause of death, nature of death, if known, and still more so if doubtful, suspicious, or mysterious, all furnish abundant and diversified material for misrepresentation, fraud, deceit, and many other sins of omission and commission. A great many persons, otherwise honest and conscientious, consider a life insurance company the legitimate prey of their fraudulent devices and conspiracies. This is not confined merely to persons desiring to insure their lives, but is also extensively practiced by the legal representatives or other claimants for the insurance money after the death of the risk. On the other hand, it must be admitted that, up to within recent times at least, a great many life insurance companies availed themselves of the most flippant excuses and the most frivolous pretexts to defeat honest claims. No doubt this has had something to do with the desire to "get square" at any cost. The law reports are full of cases in which an honest claim was contested on purely technical grounds, or on shallow subterfuges, with an expense of legal and medical learning worthy of a better cause.

It is a sign of a healthier tendency, that at the present time reputable companies content themselves with contesting those cases only which present either an important question, not hitherto judicially determined, or such an array of facts and circumstances of a suspicious or doubtful character, that *not* to make them the subject of judicial investigation and decision would be placing a premium upon fraud and dishonesty.

You are, no doubt, familiar with the more prominent medico-legal features of life insurance. They are nearly all, if the expression be permitted, of a post-mortem character. From the very nature of the contract between in-

[1] Read at the annual meeting, June 10, 1884.

surer and risk, and from the immense number of risks, scattered over a vast expanse of territory and among all conditions of men, it can easily be inferred that it is practically impossible, except in a few isolated cases, to ascertain before death those facts and circumstances which contribute to make a particular case the subject of medico-legal inquiry and investigation.

The examination of an applicant, both as to his previous history and habits and as to his present physical and mental condition, may be as exhaustive as possible, yet there will always remain a large margin for deception, misrepresentation, and concealment of important features.

Again, it is almost equally difficult to prevent deceit and misrepresentation in the proofs of death, if the persons claiming the insurance money are bent upon it. *Almost* equally difficult, yet the chances of discovery and exposure of the actual state of affairs are much better on account of the greater number of persons necessary to the carrying out of the collusive scheme and conspiracy upon which the success of the fraudulent enterprise is based.

One of the most frequent attempts at deception is that of representing a death by suicide to be due to natural causes. This was practiced extensively for a long time and as stubbornly contested by the companies. The moving cause of this class of frauds was the popular fallacy, which up to this day has a great many sincere adherents, that suicide, *eo ipso*, is an evidence of insanity. Believing this to be the case, claimants had no scruples to misrepresent and deceive in order to obtain that to which they considered themselves fairly and honestly entitled, and at the same time avoid the odium of a suicide in the family.

The defense of suicide is now but rarely resorted to, and then only in flagrant cases, although the companies certainly never admitted the theory that suicide was an evidence of insanity. The policies still contain a suicide clause, but it is rarely made the basis of contest, except in cases like the famous Colvocoresses case or the more recent Dwight case, in both of which the attempt was made to establish the fact that unusually heavy insurance had been secured with the preconceived determination to provide liberally for the surviving family by committing suicide after payment of only one or but few premiums, and by giving it the appearance of natural death or homicide.

It seems hardly necessary to state that the defense of suicide cannot prevail if the suicide is actually committed in a condition of mental irresponsibility. Yet, in order to prevent that defense from gaining any foot-hold whatever in such a case, laws have been made declaring that it shall not be a defense if the suicide is committed by an insane person.

Such a law was passed by the Legislature of the State of New York at its last session. The necessity for such a law is apparent when it is considered that the companies have changed very materially the wording, and consequently the legal bearing, of the suicide clause in their policies. That clause formerly read, that the company should not be required to pay and the policy be null and void, if the insured shall die by his own act or hand. It now reads, that the "self-destruction" of the insured is *not a risk assumed by the company.* This makes it incumbent upon the claimants to prove that

the risk is one of those which *are* covered by the policy and assumed by the company. As a rule this is a matter of great difficulty and even impossibility.

The following is a case in point, to show the quandary in which claimants may find themselves under this clause, even when it is admitted that the risk, whether suicide or not, was sane at the time of death: —

Some eight or nine years ago a New York importer was found dead in bed in his boarding house. Nothing was found in the surroundings which would point to suicide, no weapon, poison, empty bottle, etc. The autopsy, performed by the deputy coroner, revealed, however, death by cyanide of potassium, whose odor when the abdominal cavity was opened was so strong that it drove even the coroner from the room. Under the rules of the company the minutes of the coroner's inquest and the verdict of the coroner's jury must be attached to and made a part of the proofs of death.

This had to be done in this case, but the claimants expressly stated that they did not admit the truth of the inquest and verdict, and did not consider themselves bound by them. The company having ascertained that the claimants, under an assignment of the policy, were a firm of creditors of the deceased, who had persistently and continuously dunned and pestered this man, and had thereby doubtless contributed in a large measure to his death, refused payment on the ground of self-destruction. Suit was thereupon brought upon the policy, the defense of the company being that the death of the insured was one of the risks *not* assumed by the company, being one by self-destruction. When the cause came on for trial the company's counsel, in cross-examination of one of the plaintiffs, introduced in evidence the proofs of death with the coroner's minutes and verdict attached thereto, and thereupon moved for a dismissal of the action on the ground that it appeared *primâ facie* that the deceased came to his death by his own hand, and that therefore the risk was one *not* assumed by the company.

The court held that the affirmative must be with the plaintiffs to prove the cause of death; in other words, that the plaintiffs must show affirmatively that the death was the result of one of the causes whereof the risk is assumed by the company. This ruling is in accordance with a decision of the United States Supreme Court in a leading case.

How could the plaintiffs, in the face of the coroner's verdict, prove that the death was a natural and not a self-inflicted one?

Under the law of New York, suicide, in order to be an available defense, must be proven by the party setting up such defense to have been the act of a sane person. The *onus probandi* is thus shifted, and justly so, both from a legal and an equitable stand-point. The law does not and ought not to encourage any person or corporation to shield themselves by cunning devices and shrewd expedients against the consequences of their contracts and obligations.

On the other hand, there is no doubt that it is fallacious and illogical, as well as unscientific and unpsychological, to claim every suicide as the act of an insane person, and to condemn the defense of insanity *in toto* on that ground.

The New York Penal Code makes it a felony to commit an attempt at suicide. While this is undoubtedly mistaken severity and wholly indefensible on corrective and philanthropic grounds, yet the underlying principle is a sound and just one, that is, that attempted suicide is not necessarily the deed of a person of unsound mind, but is an act which, though only directed against one's self, is more or less a violation and infraction of the rights of person, and is therefore punishable.

That it is a breach of contract for an insured sane person to lessen the probable duration of life by his own act cannot be denied. It matters not whether poverty or business reverses, unrequited love, or fear of punishment cause the act. Why should not a corporation have the right to consider a contract rescinded or violated for good and sufficient cause, the same as a private individual? The answer is that in many cases, though hardly ever with the large and substantial companies, the keen competition and active rivalry between the companies have made it a matter of expediency and business policy for them to pay every claim, unless the fraud be a very gross and palpable one.

A great many cases have been published both in books and in the daily and periodical press, which are replete with the most interesting facts, especially those of mysterious disappearances, fraudulent suicides, fictitious burials, etc. Yet the most interesting cases from a medico-legal point of view are those where misrepresentations and concealment have been perpetrated by an applicant for insurance, or where the proofs of death have been so manipulated and falsified, either by the family or by friends and other interested parties, that it is very difficult, sometimes almost impossible, to ascertain the truth, which, when at last found and established, ought to, if it does not, operate as a complete barrier to the payment of the loss.

There are three principal classes of cases which come under this category: —

First. Those where the applicant makes an intentional misstatement or concealment of the truth as to family history or previous illnesses from certain diseases, which, if admitted, would defeat the application. These cases are very frequent and most difficult to ascertain and prove. In a country like this, with its ever shifting, restless population, it is well nigh impossible to establish the truth or falsity of a person's declaration as to family history in regard to diseases which are commonly accepted as capable of hereditary transmission.

Then, again, how easy is it for a risk to claim entire ignorance of the existence or suspicion of any hereditary taint! In a long and varied experience in the investigation of doubtful and suspicious cases, on behalf of one of the most prominent life insurance companies of the United States, I have succeeded in but one case in demonstrating to the satisfaction of the company, and for that matter also to that of the claimants, that the representations as to the absence of hereditary taint were willfully false and knowingly untrue. This was a case where a prominent manufacturer in a large city of the Middle States had not only his own life, but also that of his three sons, insured for large amounts. The physical examinations were highly satisfactory, and

all four were considered extraordinarily good risks. Within a few years the three sons, all of them at the time of death barely twenty-two or twenty-three years old, had died of phthisis pulmonalis, while the father continued to live in the enjoyment of the most rugged health. The death of the third son, following so shortly after that of the second and first, put the company upon its inquiry. I was requested to investigate the family history, without regard to time, trouble, and expense, and I succeeded, after the most patient and laborious researches, in a large number of places in city and country, in records of births, marriages, and deaths, cemetery and burial books, etc., etc., in obtaining a pedigree of that family for five generations back, which showed most conclusively the hereditary transmission of the disease on the mother's side, it appearing every second generation with surprising regularity. It goes without saying that the father of the three sons, *to whom all this was known*, when confronted with the proof, admitted the fraud and made even partial restitution.

Another interesting case which came under my observation, was that of the intentional concealment of a previous illness, which, if known to the company, would have debarred the applicant from insurance. It is often claimed, by those who find a particular delight in disparaging life insurance and the protection which it is bound to give to its beneficiaries, that a company, once having accepted a risk and having received the premium, ought not to try to "crawl out" of its just obligations by protecting and defending itself against such "trifles" as a few mistakes about previous illness, caused by so-called forgetfulness, absent-mindedness, etc., etc. The following case contains, perhaps, the best answer to these apologists of fraud and deceit: —

A prominent New York merchant of high business and private character obtained an insurance of $5000 on his life. A few years thereafter he applied for a second policy. The examination was entirely satisfactory. The application among other questions contained this one, "Have you ever suffered from gall-stone?" To this he answered "No." The second policy was written also for $5000. Six months afterwards he died. The proofs of death stated as the remote cause of death "biliary calculus"; as proximate cause of death "ulceration and rupture of gall-bladder and internal hæmorrhage; duration of last illness twenty-five days." Now, like Rome, biliary calculi are not built in one day, and an investigation became necessary to ascertain, if possible, how long this man had suffered from biliary trouble. Permit me to say here, before completing the history of this case, that a coroner's or medical examiner's inquest, compared to the investigation of a doubtful or suspicious life insurance case, is but child's play. The family of the deceased are, of course, if not openly against you, at least non-committal and non-communicative; friends or acquaintances as a rule know very little or nothing about the essential and material facts. If they do, they have no inclination to tell what they do know for fear of being called upon to testify. The doctors immediately seek refuge and shelter in that convenient and charitable asylum called "privilege." Obstacles and closed mouths everywhere, open or concealed hostility on all sides, dust in the eyes, if possible, anything, everything to prevent the truth from becoming known. The

family physician is the most formidable obstacle. Self-interest, professional privilege, perhaps fear of detection of mistaken or unskillful diagnosis or treatment, all these contribute towards making him as silent as a sphinx, except as to the facts absolutely necessary to be stated in the proof of death. In the face of all this active and passive opposition the investigation must be carried on. A proper regard for the interests of other risks requires that a palpably fraudulent claim should be opposed, but it must be satisfactorily proven to be a palpably fraudulent one. This cannot be done, nor can an unfounded suspicion be dispelled, without the most thorough investigation. In the case mentioned, the following facts were ascertained after an exhaustive and searching investigation: In the winter preceding his second insurance, this merchant was attacked by a dangerous illness, caused by an obstinate constipation, which finally settled into an utter inability to defecate. Peritonitis followed. Several prominent physicians were called in consultation, not all together, but successively. Every one of them, independently of the others, diagnosticated the disease as a severe attack of biliary calculus. The peritonitis finally assumed the most alarming character. All remedies had failed to produce a movement of the bowels, and the patient was given up. He had been told by at least two of the physicians what the nature of his illness was, that it was "gall-stones." He begged that a certain physician, whose fame as a specialist in intestinal diseases had reached him, be sent for as a last resort. This was done. Copious injections of warm water, suggested by him, brought on the long delayed movement, and the patient recovered. This last physician also advised him of the nature of his illness, and warned him of its almost certain recurrence. Hardly had the patient recovered when he, no doubt bearing in mind the doctor's prophecy, proceeded to an attempt at defrauding the company out of five thousand dollars by fraudulent concealment of the true state of affairs. Can it be expected that the company in a case like this should submit to imposition and pay the policy?

Another very interesting case was that of a young man, whose life was insured for $10,000. A year afterwards he died. The remote cause of death was stated as general paresis, and the immediate cause as maniacal exhaustion. Investigation showed that prior to his being insured he had been afflicted with a severe attack of tertiary syphilis requiring protracted specific treatment. As soon as the evidences of that disease had disappeared, he took out the policy, carefully concealing the fact of his having suffered from venereal disease. Would he have been accepted as a good risk if he had told the truth and concealed nothing? The history of his last illness, laboriously obtained from reluctant and hostile witnesses, showed that the paresis was caused by or was the consequence of the syphilitic lesion, and that he received up to his death and while in the private lunatic asylum, where he died, specific treatment. Yet some of the physicians attendant upon him endeavored to make it a case of sclerosis of the posterior columns and of tabes dorsalis of other than venereal origin, and denied the specific treatment. Notwithstanding all these denials and evasions, the investigation established conclusively two facts: first, that the risk died of a disease which

was the consequence of tertiary syphilitic lesion, and, second, that this lesion existed and was known to the risk to have existed before the policy was applied for. Will it be seriously contended that the company should acquiesce in such a fraud and offer no resistance to the claim based upon it?

It has been stated before that one of the chief obstacles in the way of a thorough and exhaustive probing of cases of this class is the rule, and what physicians understand and claim to be the rule, as to privileged communications. It must be confessed that the decisions of the courts, especially in the State of New York, are decidedly unfavorable to the publication by testimony or otherwise by a physician or surgeon of *any* information acquired while attending the patient, and that only the patient himself can absolve the professional attendant from the obligation of secrecy.

Section 834 of the New York Code of Civil Procedure says: "*A person duly authorized to practice physic or surgery, shall not be allowed to disclose any information which he acquired in attending a patient in a professional capacity, and which was necessary to enable him to act in that capacity.*" Our courts have held that this applies not only to facts and circumstances communicated by patient to doctor, but also to knowledge of facts and circumstances of his physical condition ascertained and acquired by the physician from attendance upon the patient, without being directly informed thereof by the patient.

Of course, professional confidence ought to be protected to the fullest extent, as otherwise unscrupulous or recklesss professional men might be enabled to do a vast amount of mischief, either from mere carelessness and want of discretion, or for purposes of gain. But it is a serious question whether, as between parties to a dispute or controversy, justice should fail, so that the professional privilege may remain inviolate even when it is relied upon to protect from the consequences of fraud and deceit.

I venture to say, and I know that in saying so I place myself in antagonism to many able judges and lawyers, that the rights of society and the demands of justice and equity ought to be superior to the rights of individuals; that the law ought not to allow any man whose knowledge (not information) is necessary and material for the establishment of exact justice to withhold that knowledge from the court, and thereby perhaps defeat the overthrow of a vicious and fraudulent claim.

Take the above case of biliary calculus, for instance. There some of the attending physicians informed the patient of the nature of his illness. Their knowledge of its character was and must have been to a considerable extent obtained from information furnished by the patient himself. Should the testimony of those physicians be ruled out and a flagrant fraud be countenanced? For upon that fact hinges the entire issue. If the patient knew that he had biliary calculus and concealed that fact, that ought to be an end to the claim.

It has been my good fortune, in the many cases which I have investigated, to convince a large number of physicians that in giving the history of a case from notes of their observations only, they violate neither the spirit of the law nor that mysterious professional, shall I call it entity or nonentity, to wit,

ethics. Those who could or would not be convinced had to be made to talk by stratagem, — the end justifies the means.

There is nothing the average physician delights in more than to find some poor victim at whom to fire broadsides of technical terms and scientific definitions. The saying is, that a little learning is a dangerous thing, but when a layman reads up a few generalities and elementary points on some particular medical question which he likes to have elucidated, the little learning generally is a dangerous thing — not for the layman. I have found this to work exceedingly well in many cases. The little learning shows the layman to be a man of some education, all the more easily, so the doctor thinks, to be impressed with Greek and Latin words, etc., because some of them are at least partially understood. Of course the main point is willfully misunderstood and misapplied by the layman, thus rendering a fuller explanation and further details necessary to deepen the impression. Then the layman begins to understand, but not yet thoroughly. More explanations, more details, more questions and answers, and very soon the layman knows all he cares to know. The doctor imagines that he has impressed the interlocutor with his profound learning, but the latter has himself learned a thing or two. This process is not patented, and is cheerfully and unselfishly dedicated to the medical examiners of Massachusetts for use in their intercourse with the legal profession.

Second. The second class of cases are those where the applicant makes an intentional misrepresentation or concealment of the truth as to mode of life or habits, which, if admitted, would defeat the application. The majority of cases arising under this category are those of intemperance, although there are also occasionally cases of extra-hazardous occupations, which would, if stated, render the acceptance of the risk extremely doubtful. The habitual excessive use of alcoholic beverages has in its train a variety of dangerous consequences, such as probability of early death, exposure to fatal accidents and violent abbreviation of life, and for these reasons excludes applicants addicted to such habits. Their concealment, therefore, becomes necessary if insurance is sought, and it is astonishing what an overwhelming proportion of teetotalers and temperance men there is in this world, if the compilation of statistics be based exclusively upon life insurance tables. The moderate use of stimulants is not forbidden or deprecated, yet the majority of applicants, for fear of being rejected, refuse to admit even that. There seems to be no reason why the concealment of this habit, or whatever you may call it, should not vitiate the policy. The point to consider is, Would the risk have been accepted if he had been known to be a drinking man? And as the answer is an emphatic No, the answer to the question as to the liability should be the same.

A case in point is the following: A New York merchant of very convivial habits conceived the idea of providing for his family by securing a $10,000 policy, and then drinking himself to death. He had been a hard drinking man for years, which, of course, the company did not know. In furtherance of his design he did that which he otherwise would not have done, he kept sober for a number of months, and, being a man of originally sturdy constitution

and powerful frame, succeeded in destroying, or at least obliterating for the time being, all traces of his intemperate habits. His examination was eminently satisfactory. Among other things he stated that he never drank alcoholic liquors. The policy was issued, and within eight months thereafter he died of delirium tremens.

It was subsequently shown that from the day of the issuance of the policy to the day of his death his life was one continuous "spree," with hardly any sober intervals.

The company refused to pay, the case was taken into court by the beneficiary, the widow, and the result was, as anticipated, a compromise.

This ending deserves nothing but censure, being but the compounding and condonation of a palpable fraud from motives of expediency and business interest. If the company had insisted upon a trial it would doubtless have received a verdict in its favor.

Third. This is a class of cases in which a forbidden occupation or journey is entered into, or a habit, detrimental to health and life, is acquired after the policy has been issued, and where the cause of death is attributable to such occupation, journey, or habit.

As to the first two (occupation and journey) the point is very clear. The latter (habit) presents a very interesting medico-legal question.

Habits of intemperance often degenerate into a condition which, in the light of modern medical research, cannot be regarded as anything else than a disease. Dipsomania, inebriety, alcoholism, whatever you may call it, is recognized and treated as a disease, and has found a distinctive place in the system of medical science. No one pretends to hold a person responsible for being afflicted with a disease, except it be self-inflicted or brought about by deliberate and willful exposure. Should a person with predetermination expose himself to the contagion of a dangerous disease, it would perhaps be very difficult to prove that such was the case, but should he deliberately use alcoholic stimulants or narcotics in excessive quantities and thereby acquire a habit which finally and imperceptibly changes into a disease, which is beyond his control, the matter would be quite different. In the latter case the perhaps at first involuntary foundation is laid for an impairment of those mental faculties and factors which, if in a normal condition, would be formidable obstacles to the physical change. In short, a physical habit is allowed to become a mental and physical disease, which is beyond the control of the individual just as much as typhoid fever or pleurisy.

Should such a tendency and proclivity be allowed to defeat a policy? To one who endeavors to be thoroughly impartial in matters of life insurance the answer must be unreservedly and emphatically a negative one, both from a medical and from a legal ground.

Fraud vitiates every contract, and for that reason the misrepresentations and concealments of applicants or others have been justly condemned, but in the class of cases under consideration there is no fraudulent intent; the minds of insurer and applicant meet on an honest, truthful basis. A guarantee by either party to do that which may be and undoubtedly is *ultra vires*, or to state it more correctly, not to do that which may and generally is *in fu-*

turo, cannot and ought not to be enforced. The frailties and weaknesses of human nature must be considered, and the law, as applicable to the relations of individuals among themselves and to others, does take cognizance of them. If it did not it would not deserve its name. *Ultra vires nemo cogi potest* is as old as it is true. This class of risks the companies ought to assume, all conditions and provisions of their policies to the contrary notwithstanding. Supposing the drinking habit is acquired by a patient to whom stimulants have been prescribed by a physician, and who continues their use after the necessity therefor has ceased to exist, simply because he contracted the appetite. Such a case came under my observation not long ago. It is very difficult, in the majority of instances, to ascertain the exact time when the habit was contracted and when it ceased to be a habit and became a disease. The defense of bad habits acquired subsequent to the issuance of the policy ought, in order to be consistent, to include all cases where the illness and death were the consequence of any and every kind of indulgence, nay, even of a reckless exposure to cold or heat or the seductive wiles of cucumber salad. Where would this lead to? There would be a defense to nearly every loss.

In the relation of insurer and insured there must necessarily be some *risk* beyond that of the probable termination of life based upon mortality statistics. It forms the basis of the relation, it is its vital point, and should have as liberal an application as is consistent with justice and equity.

There are numerous other medico-legal features of life insurance which furnish interesting data of investigation and discussion, but those mentioned in the foregoing pages are perhaps of the greatest importance.

The companies, as a rule, have not only from necessity, but as a result of enlightened administration and adaptation to the progress of science, kept pace with the advancing spirit of the age and the demands of modern research. Their medical work, both as regards statistics of mortality, epidemics, physical and chemical examinations, and problems of mental responsibility, etc., has been done conscientiously and scientifically, and has been and is fruitful of valuable contributions to medical science in its theoretical and practical aspects. Their legal work has to a great extent thrown off the shackles of narrow-minded technicality and slavish interpretation, and, while not yielding one iota to the demands of the blackmailers and rogues, has sought to infuse the dealings of the corporations with claimants and beneficiaries with a commendable spirit of fairness and liberality which is the very essence of justice among men. To both combined we owe much valuable material for scientific research and beneficial discussion of mooted points.

If the preceding remarks have in any way contributed towards stimulating further progress and study of medico-legal science as applicable to life insurance, they will find in that result a welcome justification.

NOTES OF TWO AUTOPSIES.[1]

BY S. D. PRESBREY, M. D., MEDICAL EXAMINER,

I. Early in the morning of Wednesday, April 18, 1883, I was summoned by the police to visit East Taunton to investigate a sudden death, which the neighborhood had already dignified by the title of the "Squawbetty murder case." The dead body of a woman about fifty-five years of age had been found in a small house in "Bottle Row" (suggestive name), where, during the night previous, there had been a disturbance, and every indication of a drunken carousal. The house is a small one, having three rooms on the principal floor, a front, a middle, and a rear room. The front and rear rooms open from the middle room, and admission to the house is to the middle room through a small porch, which contains the kitchen sink, over which is a window, the sink and window being opposite the outer door.

This window and sink with its contents were stained with blood, much of which was in fine sprays as if caused by jets from a bleeding artery. The middle room contained many blood-stains of the same character upon the floor and walls, and even upon the articles of crockery on the table. On the floor, near the middle of the room, was a pool of blood. In the rear room was a bed, upon which lay an old man, his head resting upon a blood-saturated pillow, his hair and face covered with blood, and a large pool of blood was on the floor, under the head of the bed.

This man was living, but very weak from loss of blood, which had occurred from a cut in the forehead that had evidently divided a quite large branch of the temporal artery. The hæmorrhage had stopped, but the old man, feeble and bewildered, was unable to give a very clear explanation of his condition. The main idea with him was that he had interfered to prevent some one from being injured, and had himself got hit, he thought with a chair.

In the front room were a bed, a table, a stove, a lounge, and a few chairs. On the floor, in front of the lounge, was the dead body of the woman whose death was to be explained. She was dressed in her ordinary clothes. The body was prone. The face was inclined to the right, and rested in an iron wash basin containing, by estimate, six ounces of bloody water; the basin being slightly tipped by the weight of the head held this small quantity of water in such a way that the mouth and nostrils of the woman were completely covered by the fluid. The right leg was extended, the left flexed, the body resting upon the left knee and chest. The left arm was bent under

[1] Read at the annual meeting, June 10, 1884.

the body; the right was extended by the side. On raising the body a little bloody water bubbled from the mouth and nose. A large bloody stain on the floor extended to the tipped edge of the basin; near the body on the floor were more marks of arterial bleeding, and on the table there was a cloth saturated with blood. There lay a pillow on the lounge with one blood-stain upon it. A pool of blood on the floor, near the head of the lounge, a bloody smooch on the wall paper near by, and a piece of blood-stained soap on the stove complete the sanguinary picture. An empty pocket-book was found on the floor, near the lounge.

The body was taken in charge by an undertaker, and conveyed to his rooms, while the proper steps were taken to prepare for an autopsy, which was made at three P. M. on the same day, with the assistance of Drs. Bassett and Galligan, of Taunton.

The record of autopsy was as follows:—

The body was that of a woman aged fifty-five to sixty years. Cadaveric rigidity was strongly marked. The skin was smooth. There was a slight abrasion one inch long on the right side of the forehead. There was a slight swelling on the right side of the head. Both of these latter, on incision, showed some ecchymosis. No other mark of violence was found. The nostrils and mouth were blood-stained. The tongue rested against the teeth.

The spinal cord was normal. The brain was normal. The sinuses and veins of the head contained rather more than the usual quantity of blood.

The mucous coat of the trachea was reddened and covered with a bloody, bubbling fluid. There was a bloody stain in the œsophagus.

The chest was quite filled by the lungs and heart. The large vessels, except the aorta, were filled with dark fluid blood. The heart and pericardium were normal. The right heart contained fluid blood. The lungs were healthy but dark in color and engorged. The liver was dark, and both liver and spleen were full of dark blood. Some bloody, bubbling matter was found in the stomach. The intestines were dark in color. The kidneys, uterus, and other abdominal organs were normal.

Diagnosis. Death by drowning.

As the body had been found in a house where it was known that there had been a drunken riot during the night it hardly seemed prudent to certify that the drowning had been purely accidental.

The public had become impressed with the idea that there had been a murder, and already two men, sons of the deceased, were under arrest. In consideration of these facts it was thought best to report the case for inquest as one of drowning, probably accidental, but possibly homicidal, that the facts and circumstances might be fully investigated.

The report of the inquest is as follows:—

The body of E. H. was found on the morning of the 18th instant, lying dead in her own house, on the floor, near a lounge, with her face partly immersed in a basin of bloody water. The autopsy and other evidence in the case clearly show that her death was caused by drowning. There were no marks of violence upon her or wounds from which blood had flowed. The

probability is that she fell from the lounge into the position in which she was found. That she was intoxicated may, perhaps, be inferred from the fact that a sober woman would not be likely to lie still and drown in a basin of water. The blood in the basin and about the house is accounted for by a drunken fight, which had taken place during the night between her two sons and one Flynn. At the time of her death the sons had probably left the house, and Flynn was asleep. W. H. Fox, *Justice.*

April 20, 1883.

II. The second case is one of infanticide.

On the afternoon of Sunday, May 18, 1884, I was notified by the police that the body of an infant had been found floating in Taunton River. The body was at once removed to my stable, where it was kept carbolized till ten A. M. the following day, when, the proper legal formalities having been complied with, the autopsy was made, of which the following is the record: —

The body was that of a female infant. Weight, six pounds. Length, twenty-one inches. Umbilicus nearly in the middle of its length. Putrefaction advanced. Abdomen green. Head very soft; hair absent. Skin upon limbs hanging in shreds. Umbilical cord, three inches in length, cut but not tied. No ulceration of umbilicus. Incised wound in the front of the neck two and one half inches long, extending back to the spine, and dividing trachea, œsophagus, cervical veins of right side, and cervical veins and arteries of the left side. Incision marked by two serrations on the left side of the neck. Just above the left end of the cut a piece of skin of the size of a ten-cent piece had been smoothly removed. A slight superficial wound below and behind the left ear. Brain softened to a thick, pinkish fluid.

Thorax well filled by lungs and heart. Surface of lungs red and decidedly "marbled;" occasional bubbles on the surface from putrefaction. Lungs crepitant and spongy; edges rounded; a little bubbling, bloody fluid could be squeezed from cut surfaces. Contents of thorax, as a whole, floated high in water and every portion of the divided lungs floated even after having been thoroughly squeezed.

Heart and large vessels normal and entirely empty. Ductus arteriosus patulous.

Liver dark in color and very soft.

Stomach contained a little grumous material, but no milk curds. Large intestine full of meconium.

The autopsy appears to justify the following conclusions: —

(1.) That the body is that of a full-time fœtus.

(2.) That the child lived and breathed.

(3.) That the child probably did not live more than twenty-four hours.

(4.) That the cause of death was hæmorrhage, possibly in part from the umbilical cord, but principally from the wound in the neck.

(5.) That the child has probably been dead at least two weeks.

Finding by W. H. Fox, Justice, May 22, 1884: —

"On the 18th of this month, the body of a new-born infant, wrapped in a woman's skirt, was found floating in Taunton River, about a mile below Weir

Bridge. The progress of decomposition indicated that it had been in the water perhaps twenty days. A deep gash across the throat showed that its short life had been abruptly terminated by the hand of violence. There is no evidence as to the author of this revolting crime."

A CASE OF HOMICIDE BY A WOUND OF THE VULVA.[1]

BY F. W. DRAPER, M. D., MEDICAL EXAMINER.

"WHEN deeply incised wounds are inflicted upon the genital organs of either sex, the fact of their existence in such a situation at once proves willful and deliberate malice on the part of the assailant. Accident is wholly out of the question, and suicide is improbable except in cases of confirmed idiocy and lunacy."[2] These emphatic words of Taylor will serve as an appropriate introduction to the following notes of a case whose presentation is justified by the fact that it is an interesting example of a very rare form of homicidal violence.

The chief participants in the affair to be related represented a low grade of city life and morals. Michael O'Neil, the convicted assailant, and his wife, Hannah, the victim, occupied a tenement of three rooms, so wretchedly furnished and appointed as scarcely to merit the name of human habitation. Intemperate, improvident, and ignorant, they lived here in wretched squalor, without apparent hope or desire for better things, and showing to their two young children a wicked example of shameless degradation. In such a home the mother came to her death under the following circumstances: —

During the afternoon and evening of Sunday, December 10, 1882, O'Neil and his wife, with two men, named Haley and Ryan, indulged freely in liquor in O'Neil's kitchen. The woman entertained her guests sometimes with songs, sometimes with loud disputes with her husband. In the course of one of these wrangles, O'Neil forcibly informed his wife that if she carried out her expressed intention to place one of their children in a public institution, he would "fix her for it." The carouse continued till after midnight, and the recollection of the two visitors concerning what transpired in the later hours of the evening was naturally vague and unreliable. But it is quite well established by the testimony of Haley, confirmed by that of an officer who passed by the house at midnight and heard Mrs. O'Neil singing, that between twelve and one o'clock Ryan went to bed on a mattress laid on the kitchen floor, while, a little later, Haley shared with O'Neil, his wife, and their two children his host's only bed, the woman lying across the foot of the bed and the children in the middle. What transpired during the remnant of the night could not be fully established in evidence. The occupant of the kitchen floor admitted that he was too intoxicated to be aroused by anything that occurred. Haley testified that some time in the night, while it was still dark outside, he

[1] Read at the annual meeting, June 10 1884.

[2] Taylor's Principles and Practice of Medical Jurisprudence, i., page 677.

was awakened by one of the children crying for her mother; to his question where the mother was, the reply was that she had gone out. Haley and the two children were the only occupants of the bed at this time, O'Neil and his wife having disappeared. Haley went to the kitchen to get a drink of water, and there he saw Ryan lying on the mattress; and O'Neil, dressed and apparently asleep, at full length, partly on the mattress and partly on the floor. After satisfying his thirst he returned to bed and went to sleep. Some time later he was awakened by O'Neil getting into bed. Haley asked O'Neil where Hannah was; O'Neil replied that he did n't know, he supposed that she was in the other room, that she was all right, and would look out for herself. Haley then fell asleep and knew nothing more till the milkman knocked at his usual hour, between five and six o'clock. That disturbance having passed over, Haley took another nap lasting, as he estimated, about half an hour, and was next aroused by O'Neil leaving the bed; he himself arose also and went to the kitchen while O'Neil passed into a small, unfurnished room adjoining the bed-room. In a moment O'Neil shouted to Haley to come and help him, that Hannah was stiff with cold; going to his aid, Haley found O'Neil in the act of raising his wife from the floor. Her only apparel consisted of a chemise and stockings, the rest of her clothing being in a pile at the foot of the bed on the bed-room floor. The two men lifted her up from the floor and carried her to the bed. As they did so, O'Neil noticing blood on his wife's chemise and person, exclaimed, "Oh! my God! look at the blood!" He quickly covered her with the bed clothing, then said, "She must have done something to herself and I 'll be blamed for it." Haley saw then that the woman was dead, and he said to O'Neil that his best course was to notify the police at once. O'Neil washed his hands, talking much meanwhile about his inability to bury his wife, as he had no money. Ryan was now awake and joined Haley in advising O'Neil not to go to work, but to report the affair forthwith at the nearest station-house. This counsel was not taken, but O'Neil left his house and went to the wharf where he was employed. Later in the morning he called upon some of his wife's relatives (her mother and brother) to notify them of her death. He told the mother that "Hannah had done something to herself so that she should n't have any young ones," intimating, as the mother understood him, that an attempt to procure an abortion was the cause of the death. To the brother he offered still another explanation, that she died "in one of her curious spells," and that he was afraid that he would get into trouble about it.

Meanwhile the police had received information of the woman's death, and the case came at once to the writer's notice for his investigation. I found the rooms in the possession of two officers who had O'Neil and Ryan under detention pending the inquiry. O'Neil's statement was that his wife Hannah went to bed about ten o'clock the previous night. After a while he and Haley went to bed in the same bed with her and the children, his wife lying across the foot of the bed. Some time in the night, when it was he did not know, Hannah left the bed. About twenty minutes past six he was awakened by Haley, who asked him where his wife was. He looked about and found her lying on the floor of the inner room, unconscious, cold, and breathing slowly.

He put her into bed and left her. He explained his abandonment of her in that low condition by declaring that he supposed her to be playing one of her old tricks of getting on the floor when she had been drinking and avowing that she was going to die. He denied all knowledge of what had occurred to her in the night, and when his attention was called to the presence of blood on her clothing he said, somewhat excitedly, "If anything 's happened to her, she 's done it herself."

I found the woman's dead body lying upon its right side in a natural posture, at the front of the bed, fully covered with the bed clothing. It was still (at half-past nine in the morning) appreciably warm; rigor mortis was present in the elbows and knees. The only personal apparel was, as already mentioned, a chemise and stockings. The lower and posterior part of the chemise was saturated with blood; and the external genitals, the nates, and the upper part of the thighs, front and back, were blood-stained. The source of the hæmorrhage was not discovered at this time.

Proceeding to inspect the adjacent unfurnished room, where the woman had been found before her removal to the bed, I saw an ordinary, medium-sized wash-tub in the middle of the floor, containing fluid and clotted blood to the amount of four quarts. On the floor, between this tub and the corner of the room nearest the door of entrance, there was a blood stain measuring thirty inches by fifteen inches, with fresh, thick clots upon it. Lying at one side of this stain were an old dress skirt and an apron much soiled with blood. Careful examination of the floor of the bed-room and of the kitchen (all the floors were bare) failed to detect any blood stains in addition to the one above described.

The autopsy was made in the afternoon of the same day, or, as nearly as could be estimated, about nine or ten hours after the death. Omitting unessential details, the following appearances were disclosed: —

The body was that of a stout, strong, though very untidy woman, apparently in vigorous health at the time of her death. There was marked pallor of the surface except upon the right side of the neck and thorax, where patches of livid discoloration corresponded with the dependent part of the body as it lay, after death, in bed during the cooling stage. There were small ecchymoses in the following situations: above the right breast, on the front of the left arm, on the front of the right wrist, just below the bend of the right elbow, on the outer side of the left forearm, on the inside of the right thigh, and on the outer side of the left knee. Along the upper surface of the lower lip, just within the dermal border, there was a broken line of narrow ecchymoses, suggesting that the lip had been tightly compressed between the teeth.

The upper part of the vulva was the seat of the only lesion from which the hæmorrhage, previously mentioned, could have proceeded. This lesion, as the specimen exhibited shows, was a wound with regular, clean-cut, slightly curvilinear edges, one inch long. Its upper extremity was immediately below the clitoris, in the middle line of the vestibule or space between the clitoris and the urethra. It took a direction downward and outward, curving slightly to the left, its lower end being a little to the left of the meatus urinarius. It

was half an inch deep at the deepest point. Its course from the surface inward was not direct, or parallel with the antero-posterior plane of the body, but there was a slight beveling from the left toward the right. In a wound so superficial and limited it was impossible to demonstrate the vessels involved in the incision, but the arteries most exposed to division were the terminal branches of the right internal pudic and of the inferior vesical.

The internal examination discovered nothing noteworthy or abnormal beyond the marked anæmia of all the organs and tissues. The stomach contained half a pint of undigested food. The womb and its appendages were healthy. The mucous membrane of the uterine cavity was slightly reddened, and the right ovary contained a typical corpus hæmorrhagicum of menstruation. The vagina showed no trace of blood. The brain was healthy. The exsanguine state of the body was the single striking feature which the examination revealed.

The autopsy having thus conclusively determined the cause of the death to have been hæmorrhage from a wound of the vulva, the next and equally important stage of the inquiry had for its object to decide the manner in which the wound was received.

Was the wound an accidental one? Nothing occurred in the entire course of the investigation to lend support to such a view. A moment's reflection upon the situation of the lesion will convince one that an accidental injury at that part of the vulva is hardly to be thought of as possible. The nates, the perinæum, the fourchette, and the posterior portions of the labia majora are the regions, if any, which receive accidental violence, while the neighborhood of the clitoris could be the seat of a wound by casualty only upon the supposition of the most extraordinary posture of the body in its relation to the wounding instrument. This wounding instrument, moreover, was not discovered in the room with the blood, and the absence of blood stains elsewhere in the dwelling indicated clearly that the entire affair had its scene in this bare apartment. Finally, it is scarcely credible that a woman, injured severely, and aware that she was becoming exhausted by profuse hæmorrhage, would suffer herself to bleed to death rather than to call her husband or her female neighbors to her help. It did not appear that any hint of her distress came to any one until she was found in the morning lying in a pool of her own blood; and this failure to summon assistance is a controlling objection to the theory that an innocent casualty caused the death.

Was the injury inflicted by the woman herself with suicidal intent? Her husband so asserted, but his assertion had no support in the facts or the probabilities of the case. Experience has shown that attempted suicide by mutilation of the genital organs is a very rare occurrence, and the recorded instances are confined almost wholly to the subjects of insanity and idiocy. The person bent on self-destruction does not usually take half-way measures, or inflict upon himself injuries whose issue seems to him clearly to be open to doubt. The surgeon and the anatomist know that wounds of the vulva are particularly grave because of the vascularity of the parts and the consequent danger of alarming hæmorrhage; but no one could seriously suppose that an ignorant woman, representing the lowest grade of intelligence, would select

her vulva for a suicidal wound, when a cut across her neck or a thrust into her breast offered a much more accessible and certain passage to death. The wound itself, aside from its situation, offers some difficulties to the theory of suicide, for its dimensions, its depth, especially its direction, are not easily explicable upon the supposition that the woman's own hand held the knife.

But it is clear, without regard to these somewhat theoretical considerations, that certain indispensable data are wanting if we would establish that the wounding was done by the patient herself. Obviously a weapon or some sharp instrument was required for its accomplishment. No such weapon or instrument was found in the room. If the wounding was done in another room, and the woman then went to the room which was the scene of the hæmorrhage, or if, having cut herself in the latter room, she had then made her way to some other part of the house to hide the weapon or to destroy it, and had then returned to take her seat over the tub to slowly bleed to death, some sign of these journeyings would have appeared in the form of a trail of blood stains on the floor of the kitchen or bed-room or both; and this evidence was wholly wanting.

What, then, is left as a reasonable explanation of the wound, the hæmorrhage, and the death, except that they depended for a cause upon the act of some person other than the deceased? We must admit that all the facts in the case are in harmony with this view, and that nothing inconsistent therewith was developed in the course of the inquiry. The act of violence was not seen, it is true, by any third party; it occurred under circumstances known only to the single surviving participant in the affair, and his lips remain silent.

But it is in just such cases that medico-legal diagnosis has its greatest fascination. In a homicide, the evidence of which is complete through the testimony of eye-witnesses or the confession of the accused, there is but little to attract the medical jurist; his connection with the investigation becomes then a matter of form merely, and assumes relations of secondary importance. It is when the truth has to be sought out by devious channels, when an aggressive defense of a suspected individual puts the burden of proof most heavily on the servants of the State, when circumstantial evidence is the only reliance, and there are in reality two sides to the question, — it is in these exigencies that legal medicine has its greatest opportunity and its chief charm. The Parkman case would have lost half its interest and instructiveness if the janitor or some other person at the medical college had seen Webster strike down his victim. The famous cases of murder by poisoning are absorbing because of the doubts which they admit, and because of the manner in which those doubts are met by the tests of the laboratory, and by the close reasoning of the unpurchased expert. So, applying the ever-safe method of elimination to our examination of this vulval wound, studying its situation and direction, the circumstances which, at some distance, preceded and followed it, the data present, and the not less important data absent, the character and habits of the woman, her conduct with her carousing companions, the behavior of the husband and of his guests before and after the death of the woman, — in fine considering all that the "view, personal inquiry, and autopsy" supplied as material for a differential diagnosis, and excluding such hypotheses touching

the manner of the death as appear manifestly inconsistent with the facts, we are then in a good position to answer affirmatively the question, Was the death by homicide? The identity of the person who inflicted the fatal injury, his motive and his weapon, are matters of remote interest in their relation to the abstract question of the cause and manner of the death. They are almost exclusively within the province of the police detective, and do not concern the medical examiner except as they may supply confirmatory facts to buttress his conclusions. A brief allusion will be made to them in connection with the present case for the purpose of completing the story.

It must have been made plain in what has preceded that from the very beginning of the investigation suspicion fell upon O'Neil, the husband; indeed, he drew it upon himself by his own behavior. If he had been a cooler and less ignorant culprit he would have avoided the mistakes into which his apparent consciousness of wrong-doing led him. No one saw him in the act of injuring his wife, but the readiness, almost the eagerness, with which he tried to throw the blame of her death upon herself, his prompt avowal that he would nevertheless get into trouble on account of it, his retreat from the scene, and his frivolous excuses for doing so, — these turned attention toward him as the probably guilty agent. In harmony with these acts were certain points in direct evidence, such as the testimony that O'Neil left his bed for an interval during the night, and was discovered lying on the kitchen floor, his wife meanwhile missing; and the testimony of a woman up-stairs, that just before four o'clock in the morning she heard O'Neil and his wife quarreling, and was sure she identified the voices. Meagre as was the evidence, it satisfied the court of inquest which found O'Neil accountable, the municipal court which held him on the charge of murder, the grand jury which indicted him for manslaughter, the jury which found him guilty under this indictment, and the judge who sentenced him.

The motive for this crime is wholly a matter of conjecture. We may imagine that O'Neil and his wife, both inflammable in disposition, as the previous evening's events showed, found some cause for a quarrel after their guests had been disposed of for the night. The previous criminal relations of the woman with one of the men then enjoying her hospitality suggests that the use and abuse of the sexual organs may have been the theme of dispute. We may imagine that, as an outcome of the dispute, whatever its subject, O'Neil suddenly resolved to mutilate his wife in a way that should teach her a salutary lesson. It is not necessary to assume that he meant to injure her seriously, far less to wound her fatally; his purpose, probably, was chastisement only. His guests were deep in the sleep of drunkenness, or so appeared, and he himself was sufficiently alcoholized to render him more reckless than delicate in his cutting. We can suppose that the woman, finding herself hurt about her genitals and bleeding freely from the wound, took her seat over a convenient wash-tub, expecting, as one attacked with epistaxis expects, that every minute would see the spontaneous subsidence of the flow. Her husband having been her assailant, she would not call for his help, as she would have done very naturally if either of the other men had injured her. So, bleeding to syncope, as she sat on the tub, she at length fell to the floor, and presently

died. Meanwhile the husband, not realizing the extent of his violence, and anxious not to awaken his bed-fellow, sought rest on the kitchen floor, where he was seen by Haley. Later, when all was quiet, and he felt quite certain that he could move about without disturbing any one, he resumed his place in bed, and remained there till the morning brought its sanguinary revelations.

The instrument, like the motive for its use, was almost wholly a matter of speculation. A knife was introduced in evidence at the trial, and the medical witness readily testified that it might have made the wound of the vulva. This knife was identified as O'Neil's; Haley had seen him cutting tobacco with it during the afternoon of their carouse. It was a knife such as a shoemaker uses for trimming soles; it had a blade about four inches long, which had become somewhat concave at its edge by long use and repeated grinding, but its rounded point was well sharpened. This blade was fixed firmly in a wooden handle. This weapon, if such it was, was found secreted behind a looking-glass in the kitchen, on the morning of the woman's death. It was given by the finder to another woman, who placed it in her stove for safe keeping over night. A fire was made in the stove by a third person, who had no knowledge of the contents of the oven, and the consequent baking and charring destroyed all evidence of blood-stain, if any existed. The person who found the knife testified that it was clean and bright when she first saw it.

But it will be proper to ask if such a wound necessarily implied the use of a knife to produce it. May not the lesion have been a contused wound, the result of a kick, the blow being received in such a direction and situation as to cause a solution of continuity simulating an incision. It is well known that the appearances of a cut may be closely imitated by a smart blow from a blunt instrument upon soft parts overlying bone, and cases are not wanting in which a wound of the vulva produced by a kick or a fall has given rise to grave doubt whether or not a weapon has been used.[1] While admitting the possibility of fatal hæmorrhage from a contused wound of the pudendum, and even granting that a kick with the shod foot might divide the tissues and leave something of the appearance of a cut upon them, it must nevertheless be insisted that the vertical direction of the lesion in the present case, its clean-cut, regular edges, its smooth inner surfaces, the absence of swelling and of ecchymosis in the adjacent parts, are quite strong points of proof that a cutting rather than a blunt instrument was used.

But however wisely or wildly we may speculate upon questions whose solution is difficult or impossible through a want of satisfactory data, the most important feature of the case remains well-founded, as an instructive medico-legal fact, and it is to this that I give the concluding word. This is the material and significant reality that within the space of five hours (taking outside limits of time) a strong, plethoric, and healthy woman bled to death by a wound of the vulva an inch long and half an inch deep. Such an occurrence, if standing alone as one observed for the first time, would be regarded as extraordinary, perhaps as incredible; but it is fortunate in being in accord with similar observations recorded in surgical and medico-legal writings. It is re-

[1] Taylor's Principles and Practice of Medical Jurisprudence, i., p. 678.

ally a typical example of an interesting class. Ogston[1] quotes the case of a woman who died in ten minutes after receiving two wounds about the genitals, one on the left labium and the other at the entrance of the vagina at its upper part; the fact that she was pregnant, and that the vascularity of the parts was thus increased, may have had some influence upon the rapidity of the hæmorrhage. Taylor[2] alludes to the case of a woman, eight months pregnant, who "fell from a chair, which also fell with her. There was hæmorrhage, and she died in a quarter of an hour. The blood had flowed from a wound an inch and a half long, situated between the right labium and the urethra." In another case[3] "a contused wound of the clitoris proved fatal. A woman, aged thirty-six, received a kick from her husband in the lower part of the abdomen while she was in a stooping posture. When seen, in about three quarters of an hour, she had lost from three to four pounds of blood, she was sinking, and expired a few minutes afterward. The wound was at the edge of the vulva, extending along the ramus of the pubes; it was about an inch long and three quarters of an inch deep. The left crus clitoridis was crushed throughout its length." These cases are of use in teaching the medical witness that, whether in the presence of a jury or elsewhere, he should be economical in the use of terms like "impossible," or "incredible," or "inconceivable."

[1] Lectures on Medical Jurisprudence, p. 486.
[2] Principles and Practice of Medical Jurisprudence, i., p. 677.
[3] Lancet, October 31, 1846, p. 478.

NOTES ON A CASE OF DROWNING.[1]

BY GEORGE STEDMAN, M. D., ASSOCIATE MEDICAL EXAMINER.

On Thursday, May 22, 1884, the body of an unknown man was found off Wellington's wharf in the water of the Mystic river. The body was that of a man five feet ten inches in height and about one hundred and seventy pounds in weight. He was about forty-four years of age, had heavy red mustache and side whiskers ("Galway sides"). He wore a dark mixed suit, white shirt, and heavy boots; this being all the information known to the medical examiner.

External examination showed no mark of violence except a bruise upon the forehead. There was no frothy foam perceptible at the external air passages, neither was there any strongly marked congestion of the face or upper part of the body, and the body was in an excellent state of preservation. Forty-eight hours after the recovery of the body there was noticed a bluish-purple discoloration of the eyelids; and upon the lower portion of the abdomen, in the iliac region of each side, there was at the expiration of another day a greenish discoloration, somewhat faint, of the size and shape of half a pea-pod.

Though from the place of finding the body, death was presumably from immersion, the fact of a decomposition developing at the abdomen primarily, and the discoloration about the eyes, which in the absence of any other appearance of decomposition about the face and head, taken in connection with the bruises on the forehead, suggested that there might be a fracture at the base of the skull, and an autopsy was decided upon.

At the time of examination, which was four days and a half after the recovery of the body, the appearances which have been mentioned had not materially changed, except that the discoloration about the eyes appeared more like the discoloration of decomposition than like the ecchymosis of a fracture.

On section there was found to be little if any congestion of the vessels of the brain.

The right heart was in no way distended with blood, and a portion of the blood in the right auricle was clotted.

The lungs were not increased in volume, and only moderately congested, neither did the section show the presence of water in these organs to anything beyond an amount which might have been readily overlooked.

The stomach contained about a teacupful of water. The other internal organs, aside from a very slight amount of congestion, presented nothing unusual.

[1] Read at the annual meeting, June 10, 1884.

While all these appearances are consistent with each other, and consistent with death from drowning, which in the absence of any other cause of death discovered post-mortem, and in view of the history of the case, is undoubtedly the correct diagnosis, the case is of interest from the absence of almost all the typical signs of death from drowning, and by the presence of some of the appearances which are supposed to contraindicate such cause of death.

The probability is that the man fell into the water, and in falling struck his forehead, producing insensibility, that he immediately sank, and being insensible he made no attempt at inspiration, thereby getting no water into the lungs. The fact that there was no struggling would account for the absence of the intense congestion generally seen in the upper parts of the body. Hence the developing of the process of decomposition in the usual manner.

REPORT OF THE EXECUTIVE BOARD

ON THE

WORK OF THE MEDICAL EXAMINERS FOR THE YEAR 1883.

PREPARED BY J. G. PINKHAM, M. D.,
Corresponding Secretary.

THE Executive Board herewith submits its report on the work of medical examiners for the year 1883.

Blank forms, prepared in accordance with the plan adopted by the Society at its last annual meeting, were sent to all the medical examiners of the State. Replies were received from fifty-six, about eighty-one per cent. of the whole number. Of the fifty-five members of the Society forty-eight made returns, about eighty-seven per cent. Eight out of fourteen non-members also made returns. We recommend that copies of the last issue of our Transactions be sent to the gentlemen last named in acknowledgment of their courtesy. Below are given the names of all medical examiners making returns, and the number of views reported by each: —

MEMBERS.

Name.	Residence.	No. of Views.
F. W. Draper,	Boston,	220
F. A. Harris,	Boston,	188
J. C. Irish,	Lowell,	76
J. M. Rice,	Worcester,	55
T. F. Breck,	Springfield,	54
Jerome Dwelly,	Fall River,	49
C. A. Carlton,	Salem,	33
W. H. Taylor,	New Bedford,	32
J. G. Pinkham,	Lynn,	27
A. F. Holt,	Cambridge,	26
G. Stedman,	Boston,	25
O. T. Howe,	Lawrence,	24
C. C. Tower,	Weymouth,	19
O. J. Brown,	North Adams,	18
S. D. Presbrey,	Taunton,	17
J. L. Sullivan,	Malden,	17
C. Haddock,	Beverly,	16
G. S. Osborne,	Peabody,	16
C. Seymour,	Northampton,	15
Alfred Hosmer,	Watertown,	14
E. P. Miller,	Fitchburg,	14
E. C. Coy,	Montague,	14
J. H. Gilbert,	Quincy,	13
F. K. Paddock,	Pittsfield,	12
J. C. Gleason,	Rockland,	12
G. N. Munsell,	Harwich,	11
B. H. Hartwell,	Ayer,	11
A. E. Paine,	Brockton,	10
G. W. Snow,	Newburyport,	9
R. R. Clarke,	Whitinsville,	9
D. W. Hodgkins,	Brookfield,	8
G. B. Stevens,	Gloucester,	8

Name.	Residence.	No. of Views.
N. S. Chamberlain,	Marlborough,	7
J. P. Lynde,	Athol,	7
S. W. Abbott,	Wakefield,	6
F. Winsor,	Winchester,	6
C. C. Holcombe,	Lee,	4
R. B. Root,	Georgetown,	3
E. W. Drake,	Middleborough,	3
H. A. Jewett,	Northborough,	3
J. Pierce,	Edgartown,	3
A. D. Kingsbury,	Needham,	2
Y. G. Hurd,	Ipswich,	2
D. B. N. Fish,	Amherst,	1
G. K. Sabine,	Brookline,	1
J. G. S. Hitchcock,	Foxborough,	1
J. B. King,	Nantucket,	1
G. P. Pratt,	Cohasset,	0

NON-MEMBERS.

Name.	Residence.	No. of Views.
L. W. Tuttle,	Holyoke,	34
George M. Morse,	Clinton,	12
F. J. Canedy,	Shelburne Falls,	10
Henry A. Barrett,	Concord,	8
Charles Sturtevant,	Hyde Park,	6
William Holbrook,	Palmer,	6
John M. Crocker,	Provincetown,	4
C. W. Whitcomb,	Barre,	3

Total number of views reported	1205
Autopsies	215
Ratio of autopsies to views	17.8+%
Inquests	225
Ratio of inquests to views	18.6+%
Prosecutions	21
Convictions in cases finished	7
Failures to convict in cases finished	8
Unfinished cases	6

The figures in the above table pertaining to prosecutions, convictions, etc., have reference solely to cases originating in 1883.

CAUSES OF DEATH IN GROUPS.

	No.	Percentage of Whole Number.
Natural	431	35.7+
Accidental	571	47.3+
Suicidal	157	13 +
Homicidal	46	3.8+
Total	1205	100.

CAUSES OF DEATH SPECIFIED.

NATURAL.

Apoplexy	42
Alcoholism	42
Aneurism	2

Anæmia	1
Atelectasis pulmonum	1
Bright's disease	1
Convulsions	13
Consumption	9
Cholera infantum	4
Cholera morbus	2
Childbirth	2
Cirrhosis of liver	1
Diarrhœa	1
Dysentery	1
Epilepsy	12
Enteritis	3
Embolism	1
Gastritis	1
Heart disease	116
Hæmoptysis	12
Hæmorrhage	5
Indigestion	2
Inanition	1
Marasmus	11
Meningitis	4
Old age	3
Pneumonia	16
Premature birth	13
Peritonitis	5
Pancreatic apoplexy	4
Pleurisy	1
Paralysis	5
Stillborn	29
Sunstroke	6
Septicæmia	2
Surgical operation	1
Typhoid fever	4
Tubal pregnancy	1
Tuberculosis	1
Tumor of neck	1
Unknown, or not stated	48
Whooping-cough	1
	431

ACCIDENTAL.

Asphyxia from smoke	4
Asphyxia (cause not stated)	1
Blows	1
Burns	10
Bursting of emery wheel	1
Carriage accidents	8
Caving of gravel bank	1
Crushed by elephant	1
Drowning	169
Elevator accidents	9
Exposure	6
Explosions	5
Electric shock	1
Falling bodies	13
Falls	62
Fracture of skull	3

Freezing	4
Fracture of spine	1
Foreign bodies in larynx	11
Injury to bowels	1
Injury to larynx	1
Injuries (nature not stated)	7
Kick of horse	1
Lightning	2
Machinery accidents	7
Overlying	6
Pistol and gun-shot wounds	9
Poisoning (opium, 5; carbolic acid, 1; embalming fluid, 1; coal gas, 1; chloral, 1; alcohol, 1; aconite, 1; arsenic, 1; ammonia, 1; lead, 1; overdose of medicine, 1; not stated, 2)	17
Railroad casualties	191
Run over	6
Struck by running horse	2
Suffocation	6
Soft soap (external application)	1
Scalds	1
Wounds	1
Manner of death not specified	1
	571

SUICIDAL.

Cut-throat	19
Drowning	30
Falls	3
Hanging	39
Knife wounds	3
Poisoning (arsenic, 3 [one of them Paris green]; opium, 8; chloroform, 3; phosphorus [rat-poison], 2; cyanide of potassium, 1; chloral, 1; chloral and hyoscyamus, 1; chloral, morphine, and gelsemium, 1; corrosive sublimate, 1; not stated, 2)	23
Pistol and gun-shot wounds	31
Strangulation	3
Manner of death not stated	6
	157

HOMICIDAL.

Blows on abdomen	1
Criminal abortion	3
Fracture of skull	4
Fracture of femur	2
Infanticide (drowning, 3; neglect, 2; neglect to tie funis, 3; strangulation, 2; suffocation, 8; exposure, 4; smashing head, 1; not stated, 2)	20
Injury to head	1
Injury to head and chest	1
Pistol and gun-shot wounds	4
Poisoning (external use of kerosene oil)	1
Starvation	1
Stabs	2
Wounds	3
Neglect and abuse	1
Manner of death not stated	2
	46

The new system of collecting statistics appears, on the whole, to have been fairly successful. A much larger number of cases has been reported than ever before, warranting the hope that in the future complete, or nearly complete, returns for the State may be obtained.

In regard to the manner in which members fill out the blank forms, it would be a modest statement of the truth to say that there is room for improvement. Many members appear to be laboring under a degree of mental confusion in regard to the information to be given under certain headings of the blank. Others, in their haste or carelessness, fail to state important facts. As an illustration of this fault it may be mentioned that, in six cases of suicide, the manner of death is not stated. There appears to have been no good reason for this omission, for if the cases were clear enough to warrant the medico-legal diagnosis of suicide, the way in which the act of self-destruction was accomplished must have been ascertained. That the above is not the only illustration of incomplete statement in the returns will be seen by an inspection of the tables which accompany this report.

The remarks which follow are designed to be explanatory of certain terms employed in the blank forms, and of the correct method of making the returns.

Under the heading Cause of Death is to be given this cause as viewed from a purely medical stand-point. In stating the cause of death it is well to follow as far as possible the statistical nosology adopted for registration in Massachusetts, a copy of which may be found in any volume of the Registration Reports. It may be proper to caution members against confusing the mode of death with the cause of death. Writers speak of three principal modes in which death may occur, namely, death by the brain or coma; death by the lungs or asphyxia; death by the heart or syncope. These terms indicate, of course, only the point at which vital action first ceases, — the leg, so to speak, of the "tripod of life," which is first knocked out, causing the structure to fall. Vital action may cease in any two of these great organs, or in all of them, simultaneously, or so nearly at the same time that it would be impossible to say where it ceased first. In these cases the mode of death can only be designated by some combination of the terms above mentioned. It is never proper to use these terms to express the cause of death except when the true cause cannot be ascertained. Their use in any case must be regarded as a confession of ignorance as to the real cause. A person ill with pulmonary consumption may die of a sudden syncope brought on, perhaps, by a slight exertion, as of rising up in bed. No one would think of reporting the cause of death as syncope. To do so would be to keep out of sight the true cause and defeat the object of registration. Similar illustrations might be drawn from other diseases.

Under the heading Medico-Legal Diagnosis is to be given the cause of death as viewed from a medico-legal stand-point. There are only four ways in which, as viewed from such a stand-point, a person may die; and these are of some natural cause, by accident, by suicide, or by homicide; or, in other words, of disease, by misadventure, by one's own hand, or by the hand of another. The medical examiner, when called to view a dead body, is bound to decide into which of these four classes the death falls; or, at any rate, he

is bound to ascertain whether the death, in any given case, is homicidal or not. If he does not do this he fails in the performance of his prime function, — that for which his office was created. The inquiry necessary to settle this question would, in the majority of instances, place the death in the class to which it belonged. To illustrate: a medical examiner is called to a case in which an autopsy reveals a clot in the brain, showing the death to have been the result of a natural cause; the course necessary here to exclude homicide fixes the class to which the death belongs at once. There might be occasional cases of drowning or shooting, particularly the former, in which it would be difficult, perhaps impossible, to decide between suicide and accident; nor would this be necessary, provided the evidence pointed clearly to one or the other as the cause of death to the exclusion of homicide. But as members of this Society we are interested in obtaining correct statistics of all deaths that come under our official notice, and it is incumbent upon us, therefore, to make the medico-legal diagnosis in all cases as precise and accurate as possible. All cases of violence come in the fourth class, that of homicide. We may use some other term to express the same idea, if in doing this we do not imply criminality. The term homicide means simply the death of one human being at the hands, or by the agency of another, whether by direct violence, by neglect, or in any way whatsoever. Legal writers tell us that a homicide may be justifiable, excusable, or felonious. The hanging of a condemned murderer by a sheriff, and the slaying of an enemy in open war are examples of justifiable homicide. To kill a person in self-defense, or by pure accident, would be excusable homicide. Homicide for which any degree of blame attaches to the person killing is felonious; and it must be either murder or manslaughter. It belongs to the court to decide the question of criminality, and to fix the guilt upon the proper parties. Every case of homicide, or death at the hands of another, should be reported by the medical examiner for inquest, even when his diagnosis is only a probable one, as it must be in many cases. As the statute law requires an inquest to be held in every case of death from accident upon a railroad, this should be made a fifth class. The verdict decides whether the death is suicidal, homicidal, or accidental. The medico-legal diagnosis should never, as given in the report, be based on the verdict. It is prior in point of time, may be only probable, and may be reversed by the verdict. If desired, a probable diagnosis can be indicated by an interrogation point. For instance, a medical examiner is called to a case of death from shooting. As he is doubtful whether the case is one of suicide or homicide, he thinks a legal inquiry should be made and the evidence sifted. Hence as a matter of legal form he reports the case in positive terms as one of violence. The verdict may declare the death to have been accidental. The medico-legal diagnosis as given to this Society should be homicide, — with a mark of interrogation, if you please, but not accident simply because this was the verdict.

It may be possible that a death due to a natural cause, to accident, or to suicide, would have to be regarded from a medico-legal point of view as homicide. To illustrate: a child is convalescent from pneumonia; a nurse, in violation of the express order of the physician, gives it a cold bath, causing a fatal relapse. Such an offense proved would be regarded by the courts as man-

slaughter. The medical examiner should give the cause of death as pneumonia, and make a medico-legal diagnosis of homicide. Again, should a person commit suicide, instigated thereto by another, the person so instigating would be guilty of murder or manslaughter. In this case the cause of death could be given, and the fact of suicide set forth with it, by some such expression as self-inflicted wound of neck, poisoning by arsenic self-administered, etc. The medico-legal diagnosis should be homicide. A similar illustration might be given in regard to accidental deaths.

It is possible to ask many difficult questions pertaining to the proper distribution of deaths into the various medico-legal classes. The following were proposed by a member in a note to the corresponding secretary: "A woman advanced in pregnancy gets on a spree, drinks hard for a week, and is found dead. This is a case of death from alcoholism; was it natural or violent? There is no reason to believe that she contemplated suicide; was it accidental? Perhaps so; but I returned it as a natural death. Again, an infant dies from improper care and diet. Not having made an autopsy I returned the cause of death as indigestion. I hardly think the medico-legal diagnosis should be homicide or accident, neither was the death natural. To what class does it belong?"

It is our opinion that as a rule deaths from alcoholism should be regarded as natural; because the use of alcohol is so wide-spread that it may be considered a common article of diet, and a death from it is very much like a death from eating any unwholesome food, or from over-eating. The death may occur directly from the violent disturbance set up in the system, or indirectly through the supervention of some disease caused by the injurious aliment. The second case should clearly be regarded as a death from a natural cause if the evidence of neglect on the part of the parents was not sufficient to warrant the diagnosis of homicide.

We give, in the table on p. 326, a few illustrations of proper and improper methods of making the returns, taken from the reports of the past year. The former require no comment. In regard to the latter some explanations are demanded, in order that members may understand fully the reasons why they are considered defective. All the items of the record are omitted from the report up to "Age," so as not to draw attention to the locality of the view, and wound the feelings of any member. It is hardly necessary for us to say that we give these illustrations not for the purpose of unfriendly criticism, but in order to emphasize our opinions in regard to the proper method of filling the blanks. We take the liberty, also, of calling attention to a few cases in which, according to our view, the medical examiner acted from an imperfect comprehension of his duty in the premises.

Reports numbered 1, 2, 3, 4, and 5 are correct in form and satisfactory in substance. In No. 6 the supposed mode of death is given instead of the cause. We say "supposed mode of death," because we cannot admit that, in drowning, death always occurs from asphyxia. If there were any good reason to conclude that in this case the death did actually occur from asphyxia, the facts upon which that opinion was based should have been given under the head of Remarks. The form of report should have been that of No. 4. In No. 7 the medico-legal diagnosis is given under Cause of Death, and *vice versâ*. The

No.	Age.	Sex.	Date of Death.	Cause of Death.	Medico-Legal Diagnosis.	Autopsy ?	Inquest ?	Verdict.	Prosecution ?	Conviction ?	Remarks.
1	41	M.	July 25th.	Hanging.	Suicide.	No.	No.	–	–	–	Occurred during attack of acute mania.
2	63	F.	May 31st.	Heart disease.	Natural cause.	No.	No.	–	–	–	Long time sick with cardiac symptoms. Sudden death.
3	72	M.	March 12th.	Crushing of legs. Shock.	Accident on railroad.	No.	Yes.	Carelessness of deceased.	No.	–	Attempted to get on cars while they were in motion, and slipped under wheels.
4	9	M.	August 1st.	Drowning.	Accident.	No.	No.	–	–	–	Attempted to cross a wet log lying over a swift stream; slipped and fell in.
5	50	M.	January 8th.	Injuries to head & chest.	Homicide.	Yes.	Yes.	Manslaughter.	Yes.	Yes.	Imprisonment for ten years.
6	13	M.	June 9th.	Asphyxia.	Accidental drowning.	No.	No.				
7	60	F.	February 5th.	Homicide.	Hæmorrhage and shock.	Yes.	Yes.	Murder.	Yes.	Yes.	Husband sent to State Prison for seven years.
8	–	–	–	– –	Murder.	–	–	–	–	–	Infanticide. New born, full term. Child's head smashed.
9	64	M.	July 8th (?).	Unknown.	Unknown.	No.	No.	–	–	–	A hermit found dead beside his hut.
10	22	M.	August 25th.	Drowning.	–	–	–	–	–	–	–
11	9	F.	November 30th.	Gun-shot wound.	Accidental.	No.	No.	–	–	–	Shooting done by an older brother.
12	18	M.	February 23d.	Fracture of skull by boiler explosion.	Accident.	No.	Yes.	Evidence of defect in boiler.	–	–	A stationary hoisting engine exploded, killing G. instantly. G. was part owner of the boiler, with his father and brother.

report of the verdict (as, also, in No. 5) was probably based upon the result of the trial rather than of the inquest; for it is not likely that a judge in his finding at an inquest would attempt to indicate the degree of guilt by such a term as manslaughter or murder.

No. 8. is defective in several respects: (1.) No cause of death is given under its appropriate heading. (2.) The medico-legal diagnosis is made to imply guilt, which it should never do. (3.) It does not appear that any inquest was held, an omission which shows the medical examiner to have erred in the performance of a most important duty. Apparently he usurped the functions of the court and prosecuting officers in deciding, first, that the case was one of murder; secondly, that nothing need or could be done to ferret out the offenders and bring them to justice. The Executive Board desires to protest in the name of the Society against all such assumptions of authority on the part of medical examiners.

No. 9 contains the curious statement that the medico-legal diagnosis is "unknown." The medical examiner must certainly make such a diagnosis if he discharges his duty, and why it should be unknown in any case passes comprehension. The fact that no inquest was held, taken in connection with the statements made under the head of Remarks, would indicate that, in this instance, the diagnosis was death from a natural cause.

No. 10 is remarkable for its many omissions. We are left in complete ignorance as to whether the death was due to accident, suicide, or homicide. A few remarks under the appropriate heading might have supplied these omissions, thus enabling us to give the case its proper place in the tables. We see no good reason why the last blank should not always be filled. One of the most conspicuous faults in the returns as a whole is the absence of a general outline of the circumstances of each case under the head of Remarks.

The point to be criticised in No. 11 is the failure there indicated of the medical examiner to diagnosticate the case as one of homicide, and report it for inquest. If we accept the statement in the last column, we must believe that the death was brought about by the agency of another person, and was therefore homicidal. Whether it was an accidental, and hence excusable, homicide or not should have been left to the court to determine.

In regard to No. 12, one query is pertinent, namely, Why, if the death resulted from accident, was an inquest held? The law says that if the medical examiner shall be of the opinion that the death was caused by violence, that is, that it was homicidal, he shall notify the proper officers in order that there may be a judicial inquiry or inquest; otherwise no further action is to be taken by his authority. Doubtless the medical examiner would say that while the death in this instance was due to accident, in his opinion, an investigation was demanded in order to obtain, if possible, the information necessary for the prevention of such occurrences. Taking this view he should have made a *pro formâ* report of homicide (or violence, if that term is preferred), so that the inquest might have been held under the forms of law. If he could not in conscience do this, he should have rested satisfied with the reflection that the law of medical examiners does not provide for such an investigation as the one under discussion.

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A CASE OF INFANTICIDE[1]

BY W. H. TAYLOR, M.D., MEDICAL EXAMINER.

M. R., aged a few years over thirty, gave birth to her fourth illegitimate child at some time during the night succeeding April 21st, 1884. She was employed as a domestic in a gentleman's family, and as she did not appear at her customary duties on the morning of April 22d, search was instituted, and she was found in bed suffering from the effects of her delivery. The physician to the poor being summoned, found a dead child lying upon the floor, closely wrapped in a shawl, together with the results and débris of the labor. Not being satisfied that the child was still-born he referred the case to me, and gave a very full account of the appearances of the room, mother, and child, which caused in his mind the suspicion that all was not as it should be. Upon arrival at the house I found the woman in bed in a room at the farther end of the attic from the stairway, which stairway was shut off from the story below by a door. She occupied this attic alone, and had neither medical nor other attendance during her labor.

Upon the floor in front of the bed, and a foot or a foot and a half from it, was a waterproof overgarment of india rubber, the edges of which had been carefully turned over to make a sort of trough three feet by two perhaps. Upon this garment was a chamber-vessel filled completely with bloody fluid and a placenta with membranes attached. Four inches of the umbilical cord remained upon the placenta, and the extremity of the cord was ragged. Besides the chamber-vessel the garment had upon it the body of a new-born child (wrapped in a red and black checked shawl), a blue flannel skirt, and a large quantity of human fæces, meconium and bloody fluid.

The mother, on being questioned concerning her labor, stated that she went to bed as usual on the night of the 21st, not expecting to be confined. At eleven o'clock, P.M., she had a desire to urinate, and rose to perform this act. Upon resuming the bed, she had a few slight pains not sufficient to prevent sleep. At midnight, as near as she could judge, she had a desire to stool, and, rising for the purpose, while in a squatting posture by the bed, she gave birth to her child, then fainted and fell to the floor. At one o'clock, A.M., she regained consciousness, and, throwing a shawl over the child, she went to bed, where she remained until found in the morning. She did not know how the cord became ruptured, or how the placenta came to be in the urinal, and the child upon the floor. She did not hear the child cry or manifest any sign of life.

[1] Read at the meeting of February 4, 1885.

Examination of the child's body revealed the following appearances. The body was well smeared with meconium, and a considerable quantity had escaped from the child. The face, hands and feet were cyanotic. The body was cold with hardly any rigor mortis. The portion of umbilical cord attached to the child was twenty-five inches long and had one turn about the child's neck, leaving a free end fifteen inches long. The extremity of the cord was ragged and bulbous, and had clot behind the incurved extremities of the vessels. The cord had not compressed the neck to leave any depression or mark, and could not have compressed it except by strong traction of the maternal end. A little whitish froth was noted about the left nostril. There was a slight caput succedaneum over the occiput and a little to the left. No marks of bodily injury were seen on inspection. The cavities of the body opening externally, contained no solids or fluids except what might naturally occupy them.

Autopsy showed a fat male child at term, twenty inches long and weighing seven and three-quarters pounds. Both testicles were in the scrotum, and the nails had grown to the ends of the fingers. No fluids escaped on inverting the child, and none were found in the respiratory passages.

On opening the body, the diaphragm was found at the level of the sixth rib. The lungs, removed with the heart and thymus gland, floated high above the surface of water. Sections of all parts of the lungs floated after being subjected to heavy pressure. Sections made from the edges of the lungs with the freezing microtome by my friend, Dr. Wm. N. Swift, who kindly assisted me, showed the air-cells to be everywhere fully dilated. The lungs were rosy red anteriorly, darker posteriorly. They contained much dark blood, and were somewhat congested centrally, and posteriorly. The cavities of the heart, particularly the right ventricle, contained a good deal of dark fluid blood, as did also the entire venous system. The liver was much congested, dark blood flowing copiously on section. The kidneys were much congested, but otherwise were normal. No uric acid infarction was observed on gross inspection. The stomach contained a drachm of yellowish fluid and some air. Air was seen in the intestines as far down as the transverse colon. The urinary bladder contained a few drops of fluid. The brain was much congested but otherwise was normal, and the same remark will apply to the upper two inches of the spinal cord.

It is certain that the child did not die of hæmorrhage. It is equally certain that it was a well-formed and normal child capable of carrying on its existence with ordinary care. No marks of injury to cause death were anywhere apparent. The appearances were those of death from suffocation, and an opinion was given to the proper legal officers that the child came to its death from suffocation, exposure, and neglect. At the inquest the justice of the district court held the woman to appear before the grand jury for murder of her child. Upon taking testimony, the grand jury found no bill against her.

Certain points of interest appear in this case which it may be profitable to discuss. First, as to the truth of the woman's story. It is evident from

preparations made that she *did* know of approaching labor, and the caput succedaneum shows that the labor was not quite tumultuous. She could have summoned aid had she been so disposed. How came the child upon the floor and the placenta in the vessel? How was the cord ruptured? If the woman fainted immediately after extrusion of the child, she must have fallen into the surrounding filth. Nothing was found upon her clothing but a little ordinary lochial discharge. The extraordinary movement of the placenta is hardly consistent with the statement of fainting. Upon inquiry, the woman stated that at time of delivery, her buttocks were not more than a foot from the floor. The cord had a free end of fifteen inches in length, and the child weighed only seven and three-quarters pounds. With regard to the sustaining power of the cord, the only reliable statement at my hand is that of Robin, quoted by A. Flint, Jr., who puts it at ten to twelve pounds. Taylor says nothing definite about it, and Tidy refers to the experiments of Negrier and others as being inconclusive, without giving any definite views of his own. I wished to make some experiments in this direction before presenting this case, but have not been able to do enough reliable work as yet, to warrant notice. If members feel so disposed, I would suggest that a good spring-balance would occupy but little room in the obstetric bag, and any information sent me will be gratefully received and acknowledged in a subsequent paper. A broad tape might be used to attach the fœtal end of the cord to the hook of the balance, and the balance being fixed, traction upon the cord to the point of rupture be made. The index of the balance could be made self-registering in many ways which readily suggest themselves. It is almost superfluous to say that such observations should be made immediately after birth of the child, as the changes going on in the cord may make delayed experimentation useless. Reports giving the length of time after delivery, the weight required to break the cord, and the part of the cord broken, would be of value in the present uncertainty on the subject. Where possible, the effect of weight combined with falling from a known distance would, if noted, be valuable, but naturally such experiments would be more subject to error than simple ones.

How long did the child live? Tardieu, quoted by Tidy, says that the presence of air in the alimentary canal indicates an existence of ten or fifteen minutes, the length of time being in proportion to the depth to which the air has penetrated. In this case, the opinion was given that the child lived some minutes. It is not probable that in this case the child breathed in the maternal passages, as the presentation was of the vertex, and the labor was not delayed.

Could the child have been strangled by the turn of the cord about its neck? The turn was what is commonly called a half-hitch, necessarily exercising no constricting power in absence of a strong pull upon the maternal end. The cord was of unusual length (twenty-nine inches) and, as has been before noticed, the position of the mother would preclude the possibility of strangulation after birth. With regard to strangulation before birth, it is evident that

the full dilatation of the lungs and the air in the alimentary canal would have been lacking. Taylor very justly says, that the term strangulation should not apply to those cases where by constriction or knotting of the cord during labor the maternal oxygen is withheld from the fœtus. Though the child dies in the same manner as in strangulation, still the term is better limited to subjects which have breathed. My view of this case is that the woman knew of her approaching labor, that she ruptured the cord by pulling upon it after the child was born and before the placenta was delivered, that she removed the placenta and placed it in the chamber-vessel, and, rolling the child snugly in the shawl to avoid warning the family of what had taken place — if for no more unworthy purpose — she went to bed, leaving the child to succumb, which it soon did by suffocation. How much exposure may have favored death, it is difficult to say. The temperature of the outside air was about 33° F. during the night. It is hardly reasonable to suppose that the mother was ignorant of the care necessary to be given to a neonatus, as she had had three children previously.

ON DEATH BY DROWNING.[1]

BY F. W. DRAPER, M.D., MEDICAL EXAMINER.

THE discovery of a dead body floating in the water, or cast upon the shore, presents to the medical examiner four problems for his solution:

I. The identification of the person dead.
II. The cause of the death.
III. The manner of the death.
IV. The interval since death.

I propose to discuss these topics very briefly in the light of my own observations during the past eight years. This experience has had as its material the personal inspection of one hundred and forty-nine dead bodies rescued from the harbor, river and other open waters abounding in Suffolk county, or cast upon the land after having been in the water, or found in tanks, privy-vaults, bath-tubs and the like, after domestic submersion. Of this number, one hundred and twenty-four were males and twenty-five were females. All ages were represented, from the new-born infant, at one extreme, to the melancholy veteran of seventy-five at the other; but nearly all were under fifty years old. As would be expected, the influence of season showed itself in the fact that a majority of the inspections occurred between May and November, the deaths predominating then because accidents incidental to bathing and sailing are then most common, and because the bodies of persons perishing by submersion during the winter months appear subsequently for the first time when the ice has gone and putrefaction brings them to view as the warmer days approach.

The first question which confronts the medical examiner when he is called to view a dead body recovered from the water is, "Who is this person?" Occasionally it is a question of much difficulty and requires considerable attention. Like other floating material, a dead human body may be borne upon a stream or by the tide many miles from its point of departure, and identification may thus be rendered increasingly difficult by distance. In March, 1879, a boy was accidentally drowned in a creek in Waltham; twenty-seven days later his body was found on the south shore of the Charles River in Boston, ten miles away from the scene of the drowning. Again, time is an element of importance in facilitating identification. Putrefactive changes speedily destroy the facial characteristics and render recognition by the features

[1] Read at the annual meeting, June 9, 1885.

impossible. But, fortunately, these cases which have to be recorded as "unknown" are very few. The friends of missing persons are on the alert to see all dead bodies which the newspapers announce to have been found, and generally the clothing and personal effects afford a ready means of identification. Of the one hundred and forty-nine dead bodies forming the basis of this paper, only twelve were buried unidentified, leaving out of the account the bodies of new-born infants thrown into the water after premature birth or still-birth.

Sometimes attention to seemingly trifling details in the description of dead bodies and their clothing is repaid by speedy and positive identification. For example, on one occasion, the dead body of a laboring man, accidentally drowned in the course of a drinking-bout, was recovered after many days in a thoroughly decomposed condition; into the published description of the clothing, I inserted the small matter that one of the shoes was laced with an ordinary shoe-string, while the other was provided with a piece of white cotton twine as a lacing; this peculiarity attracted the notice of the dead man's relatives and led to the prompt recognition of the body. In another instance, a woman's body was brought to the morgue; on her back was a square of belladonna plaster, marked on the outside with the letter and number of a hospital bed and ward; this therapeutic clew served readily to establish the identity. The value of clothing as a means of identification was illustrated, in a negative way, in a case of a man whose body was forced by the tide under one of the wharves which skirt the city's water-front; the body was nude, and though a full description of its characteristics was published, and a sufficient time and opportunity were allowed for its inspection, no one appeared who was able to state the name and home of the unfortunate bather.

But the really important question for our study to-day is the purely medico-legal problem — the *post-mortem* diagnosis of death by drowning. When a dead body is found in the water, the presumption is that the water was the cause of the death and that the person perished by submersion. To verify or refute that presumption by an inspection and autopsy of the body is, under some circumstances, a most responsible and delicate duty. The question is sufficiently easy and simple if the death was recent and the body presents none of the changes due to putrefaction; it is difficult and presently becomes impossible of solution in proportion to the advance of cadaveric decomposition.

Upon a body twenty-four hours after death by drowning, the demonstration of fatal asphyxia by submersion is a satisfactory medico-legal study, with rare exceptions; twice twenty-four hours later, the most valuable and trustworthy signs may have wholly retreated before the skirmish-line of putrefaction. That these fortunately fresh bodies constitute a small fraction of the material offered to the medical examiner for his investigation, the experience of all of us readily attests. Commonly, we are confronted with the hideously inflated, horribly distorted, nauseously infected cadaver, whose stench fills our nostrils and our memories for many days; or we view with any other then

the æsthetic sense, the remnant of mortality rescued from the sea, the skull bereft of its natural covering, the eyes long ago gone from their sockets, the nose and the lips likewise departed and exposing a grinning display of teeth, the hands, like the other accessible soft parts, appropriated by the fishes for nutritive purposes; but the clothing and every pocket and fold thereof alive with all manner of skipping and wriggling and slimy marine parasites, rendering a faithful search for the "money and other valuables" mentioned in the law, a critical test of the medical examiner's zeal. Such subjects, vulgarly called "floaters," may well lie under the presumption that they died in and by the water from which they were taken, unless an obvious external lesion, like a pistol-shot wound or a fracture of the skull, is observed upon the body and leads to another course of inquiry and to the demonstration of another cause of death.

What, now, are the post-mortem appearances upon which the examiner may rely for a diagnosis of death by drowning? In the first place, what external indications are of value, assuming that the body under inspection is that of a person who, in drowning, came to the surface at least once before final submersion, that the interval since death is brief, and that the recovery from the water was but a little time before the examination?

The sign which I regard as of the first importance, superior to all others, is the presence of froth at the mouth and nostrils. When it is present in its typical development, it affords, in my belief, sufficient evidence to establish by itself the cause of the death. It is to be distinguished from the coarser gaseous bubbles which putrefaction brings to view at the lips and which the old women who "lay out" corpses note with interest; it is fine, light and delicate, like the foamy lather of the best shaving soap. Sometimes it has a pink tinge, and occasionally a distinctly marked red color, from the blood which has become intimately mixed with it in the course of its formation in the air-passages. It is found after drowning in any kind of fluid and under all circumstances (with the possible exception of cases in which the person drowning sank immediately without once returning to the surface for air, although of this exception some excellent authorities express doubt.) I remember to have seen it very fully developed in the case of a child who was drowned in a privy-vault. It is a very evanescent sign and may not be expected after an interval of four days after death in winter and of sixty hours in summer. Its appearance externally is due to its escape and overflow from the trachea and bronchi where its primary formation occurs.

The color and condition of the skin are of interest. In the recently drowned body, promptly recovered from the water, the condition of the skin, so far as lividity is concerned, is not remarkable over regions situated below the clavicles; the face is either deeply injected so that it presents a mottled purplish color, with marked reddening of the conjunctivæ and engorgement of the ears and lips, or there is a dull sodden lividity; or, not uncommonly, there is the same pallor which characterizes the rest of the body. Whatever the hue may be at the outset, it does not persist, but a significant change

presently occurs. After an interval varying from a day and a half to four days (or even later in winter), the face, without being swollen, as at a later stage when decomposition is fully in progress, assumes a uniform, dull red or copper color, not mottled or in streaks, but equally distributed. Ogston explains this change as arising from the action of the oxygen in the air or the water, but the precise nature of the process he does not make clear. A little later, but long before the rest of the body, protected by the wet clothing, shows any alteration, the face becomes swollen and distorted, the lips protrude, and the eyelids are distended, in consequence of the advance of decomposition.

Cutis anserina, though generally observed upon the bodies of the drowned which have come under my inspection, has, in my belief, very little diagnostic value. Its presence indicates a vital reaction in the skin, but not necessarily caused by contact of cold water with the skin. Casper[1] ascribes its formation to mental shock rather than to the effect of cold on the body, and he states that he has observed it upon those drowned in the heat of summer, and frequently, also, upon those who have died otherwise than by drowning, though by violence, as by shooting, hanging, stabbing, falls and the like.

The blanching and wrinkling of the skin of the hands and feet and knees, formerly set down as among the signs of death from drowning, are now recognized as simply the physical effect of water upon the cutaneous tissues, whether living or dead.

It has not been my fortune to observe that important sign of drowning — the presence of substances grasped in the hands. Where this evidence exists, it is unquestionably a very valuable aid to diagnosis, provided the matters found in the hands are identical with those growing or floating in the water, and provided, also, the grasp of the hands upon these substances is the grip of cadaveric spasm indicating a vital act. The same rule holds here as in other cases of instantaneous rigidity: that the closure of the hand upon its contents must be more than a mere flexion of the fingers; it must be a true death-grip to give it value as a post-mortem sign.

The situation of the tongue is insisted on by some authors as important, and the examiner is advised to note whether it is engaged and more or less protruded between the teeth, or is in its normal place. In nearly every instance in which I have recorded a note on this point, the tongue has been observed in its normal relation to the teeth; in a few cases, its tip has been found engaged between the teeth, and sometimes it has been swollen and closely apposed to the palate. I have never seen it protruded between the lips.

Let us turn, now, to the appearances which the internal examination reveals. Upon raising the sternum, after the primary longitudinal incision, the increased volume of the lungs at once arrests attention. The organs are fully expanded so as almost to conceal the pericardium. They do not retract when the sternum is lifted, but they bulge forward into, and, to some extent, through the exposed space. This appearance is described by Casper as "truly thanatognomonic," and he explains it as "in part an actual hyperæria in consequence of very violent inspiratory acts carried on at the momentary emergences of the

[1] Handbook of Forensic Medicine (Sydenham Ed.), II, 234.

head of the drowning person above the surface of the water, and partly (and chiefly), in consequence of the inhalation into the lungs of the fluid in which the drowning has occurred." Dr. Ogston has attributed this condition to the presence of water or watery fluid in the pleural cavities; and the protrusion of the lungs is caused, in his opinion, by the buoyant organs floating above this fluid when the controlling pressure of the sternum is removed. This does not seem to me to be an adequate explanation, since in many cases in which I have observed the appearance to a marked degree, the amount of fluid in the pleural cavities was small, wholly insufficient indeed, to float the lungs.

To the touch, as well as to the sight, the lungs present characteristic indications. They feel like œdematous tissues, pitting on pressure. They show sometimes, the oblique impress of the ribs.

Careful inspection discovers the air-vesicles to be fully distended at the surface of the organs, and quite extensive areas of ruptured cells are sometimes seen under the pleura, as in emphysema.

The external color of the lungs is not uniform, according to my observation. Sometimes, the organs are of a pale gray color, both anteriorly and posteriorly; more frequently, hypostatic reddening is seen, the anterior parts remaining pale. In other cases, where the subject is plethoric, the entire pulmonary surface has a red or purplish hue. Much depends on the individual habit, on the interval since death, and on the position of the body in the interval. I remember one case which illustrates the influence of blood-supply. A woman committed suicide by drowning while in a condition of melancholia, induced by the progressive growth of uterine fibroids, which she regarded as incurable; they had caused repeated and profuse hæmorrhages, so that at the time of her death she was very anæmic. The lungs presented, on post-mortem examination, a singularly pale appearance throughout, the amount of blood in the body being insufficient to give to those organs any marked reddening, either superficially or upon the cut surfaces.

In the majority of my cases, I have observed punctate sub-pleural ecchymoses, generally few in number and situated in the lower parts of the lungs, and, most frequently, in the fissures between the lobes. They vary in size, the largest scarcely exceeding the size of a millet seed.

Upon section, the lungs almost invariably show clear indications of death by submersion. These indications include a more or less intense reddening of the pulmonary tissue; the abundant saturation of the lung with fluid which escapes, as in œdema, on the slightest pressure, from the entire cut surface; and the presence of froth and fluid in the air-passages onward from the trachea to the smallest bronchioles. In a few instances, I have found sand or mud in the trachea and larger bronchial branches. When the body has been recovered early from the water, I have regarded these evidences of the penetration of water and other foreign matters into the respiratory passages as valuable diagnostic indications; but the interpretation of these appearances as signs of vital acts, should, in my belief, be guarded, since we know experimentally that water may penetrate the ultimate structure of the lungs when a dead body is left suffi-

ciently long and in a favorable position in the fluid. But if, with the water, I have found in the air-passages, the fine, foamy froth previously described, I have not been left in doubt concerning the cause of the death, since it is impossible to explain the formation of this product in any other way than by the violent respiratory acts of the person submerged; it is a sufficient proof that the body, now dead, was alive when it entered the water.

The heart has almost constantly been found in a condition indicating death by asphyxia; its right cavities have been filled with blood, its left ventricle being generally contracted and empty. The condition of the heart in this respect was in harmony with the engorgement of the lungs usually present and due to the same cause.

The blood has always been found of a dark color, and generally of fluid consistency. In rare instances, I have observed clots in the right ventricle, but they were small, ragged and soft.

The appearances about the abdominal group of organs I believe to be of slight diagnostic importance. One generally finds the vessels of the peritoneum and mesentery fully injected, and engorgement of the spleen, kidneys and liver, consistent with the asphyxia, which was the predominant factor in the cause of the death.

The presence of water in the stomach has been deemed by some authors a sign of much value in the determination of death by drowning, indicating that the fluid was swallowed in the course of the submersion. When the stomach contains water or other fluid or material identical with that in which the body was found (a matter sometimes of difficulty to determine,) it is clearly a very trustworthy evidence, since we know experimentally and upon good anatomical and physiological grounds that water does not penetrate to the stomach of the dead subject, and, hence, that its presence there is a proof of vital action. Thus, when we find salt water, or dock-mud, or bits of sea-weed in the stomach, we recognize a good confirmatory sign of death by drowning. But one is not always fortunate in discovering this sign; in many of my cases, the stomach has been found either empty or containing food with very little fluid. In one case of suicidal drowning, a pint and a half of quite clear water was noted; in another case, twenty fluid-ounces of watery fluid, mixed with mud, betokened the act of swallowing in the course of the drowning. Where drowning occurs in clear, fresh water, it would require a very nice discrimination to set aside the possibility that the water contained in the stomach had not been voluntarily taken to satisfy thirst a short time before the submersion.

In about half my cases, I have observed a marked injection of the meningeal vessels and appearances indicative of hyperemia of the brain; but I have not regarded this as among the more reliable guides to a post-mortem diagnosis, since cerebral congestion may result from so many conditions immediately antecedent to drowning but wholly independent of that act.

Now, if I should summarize the various anatomical proofs of death by submersion which my experience and study have taught me to regard as most

trustworthy, I should state them thus. They fall naturally into two groups, namely, those indicating the generic cause of death (asphyxia) and, secondly, those especially showing that the death was by submersion. Of the former class of signs, the distended right cavities of the heart, the engorged lungs, the subpleural punctate ecchymoses, the evidences of hyperemia in the liver, spleen and kidneys, and to some extent also in the brain and its meninges, the reddening of the tracheal and bronchial mucous membrane, the dark, unoxygenated color and the fluid condition of the blood readily occur to mind as almost uniformly present. Of the second or specific group of proofs that the asphyxia was the result of submersion, I name the following as the more important: Froth at the lips and nostrils and in the trachea and bronchi; water in the bronchi either with or without mud and other foreign matters; extreme distension of the lungs; superficial pulmonary emphysema; water in the small bronchioles and in the vesicular structure as shown on the free escape of the fluid from the cut surface of the lung; thin, clear fluid in the pleural cavities; water, particularly muddy water, in the stomach. As confirmatory signs, I would mention *cutis anserina;* the presence of objects held firmly in the hands and clearly derived from the water in which the body was found; blanching of the skin of the palms and soles; marked lividity of the face, with injection of the conjunctivæ.

Close upon the determination of the cause of the death, follows the scarcely less important medico-legal question, its manner. Was the life destroyed with suicidal purpose, or by homicidal violence, or was it lost accidentally? It must be admitted that the solution of this problem is in great measure a police, rather than a medical matter. The phenomena of drowning do not differ materially whether their subject falls into the water, or jumps in, or is pushed or thrown in; and the anatomical appearances, both internal and external, are not susceptible of differentiation from that point of view. The material circumstances of the death, upon which almost wholly a decision concerning its manner must rest, though falling outside a strictly limited medical examination, may nevertheless come to the medical examiner's knowledge through the statements of eye-witnesses; or they may be inferred with sufficient accuracy from the condition of the body when found. Thus, the discovery of a naked body in the water, in summer, leaves little doubt that accidental drowning occurred while the person was bathing; while suicide is reasonably to be inferred when the examiner's search through the clothing is rewarded with the discovery of stones or other heavy objects in the pockets, or when he finds, as in one of my own cases, a flat-iron tied to one of the ankles. Homicidal violence by drowning is a more difficult matter. It is true that this form of homicide is of the rarest possible occurrence, and that the chances that death in any given case was either by accident or suicide greatly preponderate; yet the examiner should not allow himself to be misled by the doctrine of chances, but he should be on the alert perpetually for evidences of crime. These evidences, so far as the anatomical appearances go, are to be found in the presence of lesions indicating resistance. But there is

need of caution even here, as one or two illustrations may serve to show. In one case to which I was summoned, the body of a German brewer was found in a large tank in the basement of a brewery; entrance to this reservoir was possible only through a chute or shaft, about two feet square, leading from an upper story. The body showed unequivocal indications of death by drowning; but in addition, there were contusions upon the face and scalp not easily to be explained by the fall through the shaft. It would have been easy to entertain the theory that the man had become engaged in a quarrel with one of his fellow-workmen and had been thrown down the shaft into the water when disabled by the blows on his head. But investigation demonstrated that the ecchymoses about the head were the result of blows received two days before the death in the course of an altercation in a beer-saloon, and letters were found which indicated that the mortification growing out of the punishment which he had received from his opponent was one of the incentives which led the man to drown himself. In another instance, the body of a man was found floating in Charles river. At the inspection, I found behind the ear a contused wound of the shape of the letter H, the longest part of the wound measuring an inch and three-quarters, and its deepest part penetrating to the skull. It was such a wound as a blow with a rough stone or some similar weapon could have made, and its appearances clearly indicated that it was received before death; the skull was not fractured. The other anatomical appearances were those of death by drowning, and the inference was reasonable that the man might have been assaulted, struck heavily on the head and thrown into the water while incapable of resistance. For a month, the man's identity remained unknown; and thus the facts relating to his death were also hidden. But, at length, the woman with whom he had lodged identified his clothing and stated that two days before his body was found, he had come home late at night, very drunk, with his head wounded and bleeding and his clothing much stained with blood, appearances which were caused, according to his story, by his falling down some stone steps. It was learned that, in the course of this latest inebriety he was discharged from his usual place of work, and the fair conclusion was that, being out of money and out of employment, he destroyed himself in the despondency resulting from his financial and alcoholic misery.

Thus the signs of violence are not to be hastily interpreted. Moreover, the additional caution is to be borne in mind that under certain circumstances wounds found upon the bodies of the drowned are the results of injuries received by striking upon jutting rocks or upon bridge-timbers; or were produced upon the dead body in the efforts to recover it from the water. On the other hand, it is not to be forgotten that the entire absence of marks of violence upon the body of a person drowned is not inconsistent with the fact, otherwise established, that the death was by homicide: a man overcome suddenly by more than one assailant, and, by garroting, made incapable of self-defence; a woman similarly overpowered by muffling her head in a shawl to stifle her cries; a child without any such preparation for a violent death, all these might

easily be tossed into the water and their dead bodies would reveal to the medical examiner the signs of death by drowning only.

Among the cases of accidental or suicidal drowning that have come under my notice, one or two deserve a word on account of their peculiarities. A man, in low spirits as the result of intemperance, tried ineffectually to obtain a supply of laudanum one midnight under false pretences, and in the morning was found dead in his bath-tub, with only his underclothing on his body, and with his head immersed deeply in a pail of water in front of which he was kneeling. A child, two years old, was left alone in a room in which was a large butter-tub containing five inches of water; after five minutes' absence, the mother returned to find her child head downward in the tub and dead by drowning.

Of the one hundred and forty-nine cases which have supplied the basis of this paper, ninety-two were cases of accidental drowning; and of these ninety-two, twenty-one were bathing casualties, chiefly among boys under fifteen years old. The sudden and furious tempest of July 16, 1879, occurring while many pleasure parties were sailing in the harbor, yielded thirteen of these victims of accidental drowning.

A common and natural question addressed to the medical examiner as he stands over a dead body just brought to land, is "How long has this body been in the water?" Certain writers on legal medicine declare their ready ability to determine this problem by means of the phenomena of progressive putrefaction which the body presents. I have studied this point with considerable care and I confess that the practical fruits of my study are unsatisfactory. I cannot answer the question with any degree of precision except within very narrow limits. In a case of death by drowning, the circumstances of which are wholly conjectural at the time of the inspection, one can say with sufficient confidence, this death occurred within twelve hours, or yesterday, or the day before yesterday; but I contend that one is using his guessing privileges unscrupulously when he tells the reporters, with an affectation of candor, that the drowning occurred a month ago, or six weeks ago, or ten days ago; he really does not know and cannot know with the anatomical appearances as his only guide. I offer one or two instances in illustration. Among the victims of the gale above mentioned, were three men, of nearly the same age and physical condition, and, so far as is known, exposed to identical post-mortem influences; two of the bodies were recovered July 27, eleven days after the storm, and the third was brought ashore two days later; in all three of these, the appearances were the same as Devergie describes as proper for dead bodies recovered three and a half months after submersion, the most striking feature being the entire loss of the soft parts from the skull and from the hands. In another instance, a party of young men were sailing May 30, 1883, and two of their number, H. and B., aged twenty and twenty-one, were drowned by the swamping of their yacht; the body of H., was recovered June 21, and that of his comrade came ashore June 22, or, respectively, twenty-two and twenty-three days after death. In the case of H., all the soft parts of the head

and face were cleanly removed, and both hands were gone; while in the case of B., besides the loss of both hands, the head was missing and the cervical vertebræ were as clean as if they had been macerated and artificially articulated; the skin of the abdomen was adipocerous. These examples serve to teach us caution; they recall the fact that the problem is not a simple one and that, if the processes of putrefaction have begun their work upon the body under inspection, a considerable degree of reserve is requisite in its answer. These views are in harmony with Casper's observations touching the conditions, "of which, as yet, we know nothing," which modify the advance of decomposition, and the case which he cites to demonstrate this is sufficiently convincing. "On the 20th of March, 1848," he writes,[3] "I examined the bodies of fourteen, almost all of the same age, twenty-four to thirty years, previously occupying the same social position, all lying together in the same part of our dead-house, who had all met the same death, having been shot on the barricades on the 18th of March, and had all died at the same time. Here there certainly existed those identical conditions so necessary for instituting a comparison, and yet I can testify that in no one case did the signs of putrefaction resemble those of another." With such an authority to teach us moderation, it well becomes us to avoid dogmatic assertions about matters of uncertainty.

[3] Handbook of Forensic Medicine (Sydenham Ed.) I. page 32.

A CASE IN DOUBT.[1]

BY WALTER M. WRIGHT, M.D., MEDICAL EXAMINER.

ONE morning in 188–, the selectmen of the town of ——, directed me to assume charge of the body of one Matilda Ferguson, who had died the preceding day, and make due investigation as to the cause of her death. Such of the personal history and past physical condition of the said Matilda as concerns us at this stage of our paper may be told in a few words. She was a maiden lady of somewhat eccentric life and habits, who had lived the major portion of her seventy-three years in the quiet and seclusion of her own cottage, fully up to the high standard of virtue which Socrates so much desired of his wife. Physically she was thin, bony and angular, and although for the last score of years she had suffered from a cough which gave her the reputation of being marked for a victim of *phthisis pulmonalis*, yet she rarely found it necessary to patronize a physician, and passed for one of those tough, wiry, weazened, chronic kind, which we so frequently see live far beyond our most sanguine expectations, and oftentimes finally die of some acute disease.

During the two or three weeks immediately preceding her death, Matilda had been much of the time confined to her house and yard; yet had two or three times walked the distance of a mile to call on a sick neighbor, and had on as many occasions, owing to attacks of gastralgia and irritative diarrhœa, accompanied once or twice with thirst and bloody stools, seen fit to call in a physician whose medicine gave early relief, which usually caused a countermanding of the request to "call again to-morrow." Three or four days previous to her death, during the vacation of her old physician, she was seized with a similar but more severe attack, another doctor was called, she rapidly grew worse, sank in a collapse and soon died.

On proceeding to the discharge of my official duties, an external examination of the body made twenty-six hours after death, showed in every respect a remarkably natural appearance, save over the abdomen, which was purple and much discolored on its entire surface; rigor mortis was entirely absent, except in the fingers and toes, and the skin was absolutely devoid the characteristic look and feel of death.

The application of the knife drew venous blood in a somewhat darkened but, at the same time, in a decidedly fluid state, and in no part of the system were any actual clots found.

The opening of the several cavities of the body gave escape to absolutely no odor, in so much that a young lady, present for the first time at such an exam-

[1] Read at the meeting of October 7, 1885.

ination, (which in this case was made in a small, close room), professed that she was able to detect no smell whatever.

The autopsy showed: *First*, a brain whose dura mater was intensely injected and irritated, especially in the region of the vertex, whose superficial vessels were more than usually congested and in whose convolutions, fissures and ventricles nearly six drams of watery serum were found.

Second. A right lung whose lower two-thirds were bound by old pleuritic adhesions; a left lung free from adhesions but covered on its anterior surface particularly of the lower lobe, with a thick gelatino-plastic exudation, and in whose hemi-thorax there were four ounces of serous fluid. Both lungs were intensely congested and would not collapse on the application of moderate pressure.

Third. A heart healthy in every respect, containing a small amount of blood which showed little tendency to form clots.

Fourth. A liver, particularly healthy in every part save the extremity of the left lobe, which was slightly hardened.

Fifth. A stomach highly irritated at and about both orifices.

Sixth. Bowels thoroughly congested throughout, and showing the appearances of severe irritation over a large extent of surface.

Seventh. A pair of kidneys and a bladder in which no abnormal appearances could be detected.

Eighth. A uterus and vagina whose mucous lining was highly inflamed.

Deeming the results of this examination such as to warrant grave suspicions of the presence of an irritant poison, large sections of the brain, lungs and liver, and the other organs named entire were separately sealed and submitted to the examination of an expert chemist, Dr. Charles Harrington, of Boston.

While awaiting the result of his investigations, it may not be improper or uninteresting briefly to consider a chapter or two in Matilda's private and domestic life. I have intimated that her life was a lonely and secluded one. Such had been the status until about nine or ten months previous to her demise, when a stranger, a roving adventurer, a Spanish creole, (named Thomas Collins), aged about forty, in appearance and respectability but little above the average specimen of the genus tramp, having by some means obtained a knowledge of Matilda's habits of life and pecuniary condition, by arts and wiles, best known to himself, introduced himself to her notice and good graces, installed himself a member and guardian of her household and to all outward appearances became a most devoted attendant and admirer. During her illness, until very near her end, he alone cared for her and prepared her nourishment. After her death he immediately produced a will properly drawn, signed and witnessed, by which her snug little property, acquired by three score years and ten of the strictest parsimony and frugality, was to pass without reserve into his possession. He made no claim of a marriage but said it had been mutually agreed by them that the survivor should inherit the all of the other, which in Mr. Collins' case might be algebraically expressed by a minus more closely than by a zero. That the peculiar and uncertain ways of

the law might by no possible means deprive him of his rights (?) he himself had written the will and the childish old lady had executed it.

A neighbor, who called once or twice during Matilda's sickness, stated that gruel prepared and administered by the said Collins' hand caused nausea and gastralgia, and that some taken from him two days preceding death produced a marked change in her condition, from the prostration of which she never rallied.

The chemist's report was received three weeks later, and from it I quote these words: "The examination has yielded entirely negative results, no poison either organic or inorganic being detected." In a subsequent letter relative to the cause of death, the same gentleman says: "I can only say that it is one of those cases where it is very difficult to form an opinion."

It may not be uninteresting, though perhaps immaterial, to add by way of a codicil that Mr. Collins in a few weeks so far recovered from his grief at the loss of his adopted companion, under the soothing action of the balm of the affections of an ancient widow, possessed of a cash capital of about $3,000, as to engage himself in marriage to the "blooming old gal" of some sixty-five springs; but having got the above-named collateral well into his own hands, he neglected to present himself before the parson, but suddenly departed to other fields and widows fair. A strong arm and officer of the law reached him in a neighboring State, and when the warm and forgiving-hearted widow gave him the alternative to marry or to suffer, he evidently saw wisdom in the oft-quoted scripture, for he quickly chose the former with all its dread liabilities of the latter.

Now, gentlemen, in this rambling and semi-careless way, I have endeavored to give you the most material points in, and the main outlines of, circumstances bordering on a case which to me was, and still is, puzzling, perplexing and unsatisfactory; and since nothing in the future seems likely to throw any additional light thereon (unless possibly there may be a mysterious death and consequent autopsy of the present Mrs. Collins) you may very readily understand why I saw fit to label this paper "A Case in Doubt."

REPORT OF THE EXECUTIVE BOARD

ON THE

WORK OF THE MEDICAL EXAMINERS FOR THE YEAR 1884.

PREPARED BY J. G. PINKHAM, M. D.,

Corresponding Secretary.

THE report of the Executive Board containing such statistical information in regard to the work of the Medical Examiners during the year 1884, as it has been possible for the Corresponding Secretary to obtain, is herewith presented. Circular letters and blank forms for the return of cases were sent, as usual, to all the members of the Society. Replies were received from forty-six members, whose names, with the number of cases reported by each, are given below:—

MEMBERS.

Name.	Residence.	No. of Views.
F. W. Draper,	Boston,	211
F. A. Harris,	Boston,	191
J. C. Irish,	Lowell,	61
W. H. Taylor,	New Bedford,	49
T. F. Breck,	Springfield,	48
O. T. Howe,	Lawrence,	48
A. F. Holt,	Cambridge,	40
J. G. Pinkham,	Lynn,	31
S. D. Presbrey,	Taunton,	28
G. B. Stevens,	Gloucester,	20
O. J. Brown,	North Adams,	18
J. A. Mead,	Watertown,	18
G. W. Snow,	Newburyport,	16
J. L. Sullivan,	Malden,	15
C. Seymour,	Northampton,	14
J. H. Gilbert,	Quincy,	13
A. E. Paine,	Brockton,	12
F. K. Paddock,	Pittsfield,	11
F. Winsor,	Winchester,	10
E. C. Coy,	Montague City,	10
B. H. Hartwell,	Ayer,	9
W. M. Wright,	Orange,	9
C. C. Tower,	Weymouth,	9
G. N. Munsell,	Harwich,	8
J. P. Lynde,	Athol,	8
J. C. Gleason,	Rockland,	8
E. P. Miller,	Fitchburg,	7
D. W. Hodgkins,	Brookfield,	7
J. B. King,	Nantucket,	5
D. B. N. Fish,	Amherst,	5
C. Haddock,	Beverly,	4
G. S. Osborne,	Peabody,	4
H. A. Jewett,	Northborough,	4
N. S. Chamberlain,	Marlborough,	4
S. W. Abbott,	Wakefield,	3
A. Hosmer,	Watertown,	3
A. H. Hodgdon,	Dedham,	3
J. G. S. Hitchcock,	Foxborough,	2
D. W. Miner,	Ware,	2
R. B. Root,	Georgetown,	2
G. P. Pratt,	Cohasset,	2
J. M. Crocker,	Provincetown,	2
J. G. Hayes,	Ipswich,	2
G. L. Ellis,	Middleborough,	1
G. K. Sabine,	Brookline,	1
G. E. Putney,	Reading,	1

Total number of views reported	979
Autopsies	194
Ratio of autopsies to views	19.8+%
Inquests	204
Ratio of inquests to views	20.8+%
Prosecutions	18
Convictions in cases finished	8
Failures to convict in cases finished	9
Unfinished cases	1

CAUSES OF DEATH IN GROUPS.

	No.	Percentage of Whole Number
Natural	324	33. +%
Accidental	469	47.9+%
Suicidal	141	14.4+%
Homicidal	45	4.5+%
Total	979	

CAUSES OF DEATH SPECIFIED.

NATURAL.

Abscess	1
Asthenia	1
Alcoholism	46
Apoplexy	26
Bright's Disease	4
Convulsions	5
Cousumption	5
Congestion of lungs	3
Congestion of brain	4
Cholera Morbus	1
Cyanosis	1
Diarrhœa	1
Epilepsy	3
Enteritis	2
Exhaustion	1
Embolism	1
Erysipelas	1
Fatty degeneration of liver	1
Gastro-enteritis	1
Heart disease	94
Hydrocephalus	1
Hæmoptysis	4
Hæmatemesis	1
Hæmorrhage (source not stated)	2
Inanition	2
Marasmus	3
Meningitis	1
Old age	6
Pneumonia	13
Purpura Hæmorrhagica	1
Peritonitis	1
Premature birth	21
Pancreatic apoplexy	4
Paralysis	1
Pulmonary thrombosis	1
Still-born	27
Sun-stroke	1
Starvation	1
Strangulated Hernia	1
Septicæmia	1

Scarlatina	4
Typhoid Fever	1
Whooping Cough	1
Unknown or not stated	23
Total	324

ACCIDENTAL.

Asphyxia	1
Burns	11
Carriage accident	1
Caving in of well	1
Concussion of brain	1
Drowning	166
Elevator accidents	3
Exposure	2
Explosions	6
Falling bodies	4
Falls	45
Fracture of skull	6
Foreign bodies in larynx	6
Gastritis	1
Hæmorrhage	1
Injury to head	3
Injury to bowels	1
Injuries (general, or not stated)	3
Kick of horse	2
Lightning	1
Machinery accidents	3
Overlaying	3
Pistol and gun-shot wounds	6
Poisoning (aconite, 1; carbolic acid, 2; coal gas, 3; compound of narcotics, 1; chloral, 1; digitalis, 1; opium, 1; oil of tansy, 1; not stated, 2)	13
Railroad casualties	143
Run over	11
Suffocation	19
Strangulation	3
Not Specified	3
Total	469

SUICIDAL.

Crushed by cars	2
Cut-throat	10
Drowning	29
Falls or leaps	2
Hanging	34
Knife wounds	1
Pistol and gun-shot wounds	27
Poisoning, (arsenic, [paris green, 10] 16; alcohol and shellac, 1; corrosive sublimate 2; carbolic acid, 2; chloroform, 1; morphine and chloral, 1; illuminating gas, 1; opium, 10; phenol, 1)	35
Strangulation	1
Total	141

HOMICIDAL.

Burns	2
Blows on abdomen	1
Criminal abortion	4
Freezing	1

Fracture of skull	4
Hæmorrhage from blow on nose	1
Infanticide (cut-throat 1 ; drowning, 3 ; exposure, 1 ; neglect, 2 ; strangulation, 4 ; suffocation, 4 ; not stated, 2)	17
Injury to head	4
Neglect and abuse	1
Pistol and gun-shot wounds	7
Poisoning (nux vomica)	1
Scalds	1
Strangulation	1
Total	45

In the following table the statistics of the different years are compared.[1]

	1877 6m.	1878.	1879.	1880.	1881.	1882.	1883.	1884.
Views	430	819	800	977	957	891	1205	979
Autopsies	116	196	182	229	179	189	215	194
Ratio of autopsies to views	27%	23.9%	22.7%	23.4%	18.7%	21.2%	17.8%	19.8%
Inquests	99	172	152	197	189	179	225	204
Ratio of inquests to views	23%	21%	19%	20.1%	19.7%	20.1%	18.6%	20.8%
No. of deaths from natural causes	102	328	302	345	383	336	431	324
Ratio to whole number	23.7%	40%	37.7%	35.3%	40%	37.8%	35.7%	33%
No. of deaths from accident	206	331	322	415	396	374	571	469
Ratio to whole number	48%	40.4%	40.2%	42.5%	41.4%	42%	47.3%	47.9%
Fatal railroad accidents	77	117	90	138	124	133	191	143
Ratio to whole number	18%	14.3%	11.1%	14.1%	12.9%	14.9%	15.8%	14.6%
No. of deaths from suicide	71	92	122	113	112	117	157	141
Ratio to whole number	16.5%	11.2%	15.2%	11.6%	11.7%	13%	13%	14.4%
No. of deaths from homicide	51	68	54	104	66	64	46	45
Ratio to whole number	11.8%	8.3%	6.7%	10.6%	6.9%	7.2%	3.8%	4.5%

In the manner of filling out the blank forms, the returns show some improvement over those of the previous year, but in not a few instances there are evidences of inexcusable carelessness in their preparation.

One medical examiner reports an autopsy in every case of death from accident upon a railroad, to which he was called. Why an autopsy should be required under such circumstances, except in very rare instances, we are unable to see; as usually, the bodily injuries are so manifest and extensive, that a mere view suffices to settle at once the question of the cause of death. It is possible that the medical examiner referred to, may have formed for himself a definition of the term "autopsy," that would include the superficial examinations commonly made in railroad cases. Such a definition is inadmissible, in our opinion, inasmuch as it destroys the distinction between a "view" and an "autopsy." A medical examiner living outside of Suffolk county who should attempt to carry out in practice a theory like this, might attain, as some have already done, the proud distinction of having furnished the subject for a paragraph in the annual message of his Excellency, the Governor. Under the

[1] The percentages in this table have all been calculated from the original data. They differ from those given in the reports of previous years, for the reason that the total number of deaths as classified in the four groups designated as natural, accidental, suicidal, and homicidal, has been taken as the basis of calculation, instead of the total number of views reported. These totals, it is plain, ought to be the same in amount for each year. That a discrepancy exists in all the reports except those for 1883 and 1884, is due, probably, to the fact that under the old plan of collecting statistics, members sometimes gave their total number of views, but did not distribute them all into the different classes.

provisions of the new law, he ought, also, to have some difficulty in obtaining his pay for such easily made autopsies.

The Society is to be congratulated upon the fact that hereafter this work of collecting and preserving statistics will be performed by the State, which having power to compel returns from medical examiners, will be able to make its figures complete, and hence much more valuable for study than those which we have been able to obtain.

TRANSACTIONS

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THE "DUNBAR" CASE.[1]

BY F. K. PADDOCK, M.D., MEDICAL EXAMINER.

At 10.45 P. M., July 4th, 1885, I received notice that George S. Dunbar was found lying in Water street, Pittsfield, dead, with a wound in the back of his head. I immediately repaired to the place, and viewed the body at 11 o'clock P. M.

That part of Water street where the body was found is fifty feet in width, bounded on the south side by the Housatonic River, and on the north by a picket fence, back of which is a vacant lot. The street has no sidewalks. The travelled roadway is fifteen feet in width. On the north side of the roadway there is a space ten feet in width, extending to the fence, covered with grass. South of the roadway, the grass extends down the river bank twenty-five feet to the water. The street is unlighted at night, and the only building on that part of the street is the gas house.

The body lay parallel with the street, upon the grass between the roadway and the fence, with the head toward the east. When first discovered, the body was lying face downward; but it had been rolled over by the person who discovered it, and I found it lying upon the back, face upward. The night was very dark, and the view was made by the aid of lanterns. The body was warm; the face, back of the head, the adjacent hair, and the back of the neck, were discolored with fresh blood. The lids of the left eye were discolored and greatly swollen, presenting the characteristic appearance of a bad black eye, such as ordinarily results from a stunning blow upon the tissues covering the orbit.

At the back of the head, in the occipital region, just to the right of the median line, was a wound of sufficient size to admit of the little finger being passed through the skull into the brain, from which warm blood slowly oozed.

Lying beside the body, evidently on the spot occupied by the head before the body was turned over, was his hat, the brim of which was covered with blood, and there was a blood stained spot of grass under and beside the hat, where the blood had evidently trickled from the wound in the back of the head.

The body was dressed in a black cassimere suit. The coat was a loose sack, buttoned at the upper button. The examination of the pockets revealed the absence of his pocket-books and money. The pockets of the coat contained

[1] Read at the meeting of February 3, 1886.

only a white cambric handkerchief and three pistol cartridges, No. 32 calibre. His vest pockets contained a watch key and a cheap Waterbury watch, which was running. In his trousers pockets were a bunch of keys, and two or three blank gas-bills.

Upon the ground, close to the right ankle, as the body lay upon the back, was found a 32-calibre revolver, with five chambers; three of the chambers were empty, one contained a loaded cartridge, and the remaining one, an empty shell. To the handle of the revolver was tied one end of a piece of strong brown twine. This twine measured just ninety feet in length, and lay on the grass along the side of the roadway, the free end being about fifty feet from the body.

It was fastened to the handle of the revolver in such a way as to form a loop, which could be made to hold the hammer in a position half-way between half and full cock. When so placed, the weapon could be discharged by pulling on the string; this would free the hammer and allow it to fall. Experiments made with the revolver afterward showed that the cap of the cartridge would not explode every time the hammer dropped, but would average once in five or six times.

The chief witness at the view was a young man, who discovered the body as he was walking along the street, shortly after ten o'clock, on his way home. He first supposed the body to be that of a drunken man, and he called to two companions he had left upon the river bridge only a moment or two previously, to come to see who it was. One of them lighted a match and identified Dunbar. They then went to the gas-house, procured a lantern, and, accompanied by two employés at the gas-works, returned to the body, which they rolled over on to the back, and discovered that life was extinct.

A wagon was procured, and I had the body conveyed to his residence on Howard street. Before leaving the house for the night, I had a search made for Dunbar's wallets, in which he was known to usually carry considerable money, thinking that he might have left them at home when he went out that evening, but they could not be found.

The autopsy was made 10.15 A. M., July 5th, twelve hours after death, in the presence of Drs. J. F. A. Adams, Henry Colt, Jr., William L. Paddock, H. W. Dewey, and S. C. Burton. The body was well nourished and muscular, but without much adipose. Rigor mortis was well marked. The signs of injury were confined to the head only. The face was badly disfigured by the ecchymosed and swollen condition of the lids of the left eye. There was no other appearance of injury to the face. The blood was carefully sponged from the hair and scalp about the wound in the back of the head. The hair was not singed, nor could there be found any powder mark on the scalp. The wound through the scalp was round in shape, and a little larger than the opening through the skull. The edges of the scalp wound, as well as the bone forming the circumference of the opening through the skull, were blackened by lead which had been rubbed off from the bullet in passing through.

The calvaria was removed. The dura mater was found unusually adherent to the skull. In the posterior portion of the falx cerebri was a deposit of bone, shaped like a button, three-fourths of an inch in diameter, and one-eighth of an inch thick. The wound in the skull was irregularly round and situated in the occipital bone, one-third of an inch to the right of the median line, very near the occipital protuberance, just below the semi-circular ridge. The appearance of the wound indicated that the line of flight of the bullet was at right angles with that portion of the bone wounded. Several small spicula of bone were found in the lacerated cerebellum. The wound passed below the right lateral sinus, and extended upward and forward, through the posterior lobe of the right hemisphere of the cerebellum, through the posterior and middle lobes of the right hemisphere of the cerebrum, where, at the upper surface of the middle lobe, the wound changed its direction and passed downwards, forwards, and slightly inwards, and terminated in the anterior lobe of the cerebrum, close to the longitudinal fissure, where the bullet was found, in a position half-way between the anterior and posterior borders of the right anterior lobe, just above the right lateral ventricle. The brain substance was very much lacerated along the course of the wound. The left hemisphere of the brain was uninjured, and apparently in a perfectly normal condition.

The internal surface of the skull was searched with great care to discover any fracture that might have resulted from the concussion of the bullet, or from other sources, but none was found.

The bone was removed from the roof of the left orbital cavity, as well as the cribriform plate of the ethmoid in order to discover if there was any connection between the bullet-wound and the contusion or injury to the left eye. The orbital cavity was found full of clotted blood, which had infiltrated the cellular tissue behind and around the ball, pressing it forward as far as the optic nerve permitted. The cellular tissue of both lids was also fully infiltrated. There was clotted blood in the left nares, but the bone was found uninjured, and there was not any fracture extending from the wound in the occipital bone made by the bullet.

The bullet was very much flattened and its circumference was irregular and jagged, and presented the appearance of having struck the bone squarely on end; the base of the bullet was not bruised and exhibited the creasing marks of the barrel of the revolver and exactly fitted the empty shell found in the chamber of the weapon. The three cartridges found in the coat pocket exactly resembled those in the revolver.

The developments attending the view and the autopsy rendered the case problematical. Was it suicide or was it murder? Did this man shoot himself or was he shot by another? In order to intelligently consider these questions and properly weigh the evidence favoring the two theories, it is necessary that we should know something of the history of the deceased.

George S. Dunbar was born in 1836, in Pittsfield, where he lived until his death. His father kept a grocery store and a fish market. He was edu-

cated at the Grammar School. At the age of sixteen he was apprenticed to a mechanic and learned the machinist's trade. After attaining his majority and finishing his apprenticeship, he was employed in a woolen factory as machinist. He was married at twenty-eight years of age, and his wife kept the factory boarding-house, while he worked at his trade in the mill. At the age of thirty-three, he was appointed superintendent of the works of the Pittsfield Gas Company, a position he had ably filled for sixteen years at the time of his death. Soon after receiving the appointment of superintendent, he bought a house on Howard street, near the gas works, where he has since lived. Physically he was strong, vigorous, and very active. Although rather spare in form, he was muscular and possessed great endurance. He never had any severe illness, with one exception, and that was a temporary attack. On several occasions he had been overcome by the inhalation of illuminating gas, while at work in an excavation endeavoring to find a leak in the gas pipe. About four years ago, he was carried home in a paralyzed condition from this cause, and for twelve hours afterward, he was delirious and had several severe convulsions, during which opisthotonos was well marked. He recovered in forty-eight hours and was at work again.

His duties as superintendent were arduous. Leaks in the gas-pipes, in various parts of the town, as well as the locating and laying of new pipes, he attended to. The monthly and quarterly record of the numerous meters, he took himself, besides making out and collecting a great many of the bills.

He was in the habit of carrying with him in a large wallet a considerable amount of money, varying from fifty to two hundred dollars, which he took no pains to conceal, and exposed it freely whenever he happened to be about town when making change, as he collected the gas bills. He was called upon by everybody in town using gas, to correct any fault found with the illuminating vapor. The prompt fulfilment of all these duties demanded constant activity early and late, and Mr. Dunbar was always equal to the emergency. He was strictly temperate and scrupulously honest in all transactions. However trying or vexatious were the demands and whims of unreasonable gas-takers, he always appeared cheerful and unruffled, and faithfully endeavored to relieve the cause of dissatisfaction. He had a pleasant home and a happy family, consisting of a wife and four children. His salary as superintendent was more than sufficient to support them comfortably, and he was able to save a small amount of his annual income. Some eight years ago, he and his brother bought some stock in Wall street, not as a speculation at first, but as an investment. In the course of a few years, however, they became somewhat familiar with the stock-market and were more or less infatuated with the excitement and the possibilities of dealing in stocks, and they began to speculate, at first carefully and successfully, so much so that when the brother died of cerebro-spinal meningitis in 1881, they were reported to have made between twenty and forty thousand dollars. It is a singular if not a significant fact, that George's death occurred on the fourth anniversary of his brother's death. It is not known that George met with any serious losses, subse-

quently, until the spring of 1884, when, by an unfortunate and unexpected change in the price of stock which he had bought on a margin, he lost all that he had made; and it is supposed that he also lost a small amount that he had borrowed. For the fifteen months following this reverse there is no evidence that he dealt in stocks at all, and in April, 1885, he settled with his broker in New York and withdrew the balance of his account. He did not allow his interest in stocks to interfere with his duties as superintendent of the gas company. The business was carried on by telegrams through brokers in New York. He developed a considerable degree of ingenuity in the line of his business as superintendent. He made several practical inventions, one of which is very successfully used for lighting and another for extinguishing the street lights at night. Within the last five years he has paid considerable attention to life-insurance as an investment. As soon as it was discovered by insurance agents that he was interested in the subject, he was beset by representatives of various companies. At first he stated that he wanted insurance to the amount $25,000. He got $21,000 in regular life-insurance companies, but finally several declined to insure on account of his having had convulsions after inhaling the illuminating gas. This seemed to annoy him and induce him to seek insurance in companies and mutual benefit associations that were not so particular about their risks, and he ultimately secured $66,000 of insurance, divided among various companies, associations and fraternal societies.

Several times he noticed that he was followed by one or more ill-looking men, as he made his rounds of observation of the burning of the gas at night, as he walked through the back streets, and he mentioned the fact to the officers of the gas company. They cautioned him about exposing his money so freely when he had occasion to make change on the street, and advised him to carry a pistol. He replied that he was not afraid, that he never carried a pistol, and he disliked to do so. At the inquest there was no evidence to show that he ever carried one, except the testimony of a hardware merchant, who stated that he had sold him a revolver last April, similar in pattern to the one found by his body; but on subsequent examination by the judge, he and his clerk made such conflicting statements that the court was led to believe that the merchant did not sell him the revolver found by the body, although he may have sold him a different one. His family knew that he owned two revolvers, and they were both found in his house in their usual places after his death.

I speak quite confidently of Mr. Dunbar's character and habits, because I had known him rather intimately for fifteen years. Our offices were on the same floor of the same building and adjoined, so that, in addition to my knowledge of him as his family physician, I saw him nearly every day as he was about his business. At the time of his death he had an annual income of between three and four thousand dollars, which was more than enough to comfortably support himself and family. His assets, as near as could be ascertained at the inquest, were $18,170, while his indebtedness was $22,200, making a

difference of about $4,000, which he owed for borrowed money. This amount with his good health and regular income could hardly have caused him especial anxiety, or have been the cause of despondency.

The day preceding the evening of his death was spent apparently as usual, and he went to his home about six o'clock, P.M., and reclined upon the sofa during the evening, the time being occupied in reading and in conversing with his family. Between half-past nine and ten o'clock he left the house, saying that he was going to investigate a reported leak in the gas-pipe under the Elm-street bridge, near where his body was found shortly after ten o'clock. In fact, he was seen by several people walking in a direction which he would naturally take in the night to go to this bridge; but whether he had been there and was returning by the gas-house when he met his death, or was on his way to the bridge when it occurred, is unknown.

The inquest was held by Judge Tucker, beginning a few days after the death of Dunbar, and continued for several weeks. Every person was examined, who, it was supposed, could throw any light upon the cause of death, whether theoretical or practical.

Among the medical examiners called to testify, was Dr. D. B. N. Fish, of Amherst, whose investigations regarding powder-marks upon the skin, in the event of bullet-wounds from pistols held near the body, rendered his experience and experiments of value, in determining the question of possibility of a person shooting himself as Dunbar was shot, with the revolver found by the body, without exhibiting powder marks on the hair and scalp about the wound. The inquest was conducted with care and perseverance, but nothing in the testimony positively indicated the precise method of the shooting. Several detectives were employed, who very soon came to the conclusion that it was a case of suicide. One of them discovered a mark or crease across the sole of the right shoe which Dunbar wore when found, that might have been made by the twine that was attached to the handle of the revolver, indicating that the twine had been drawn tightly across the sole of the shoe with the left hand, while the right hand held the weapon in position for firing. Dr. Fish testified that, without using the twine, the revolver could possibly be fixed and fired twenty-six inches from the head so as to make a wound like the wound in Dunbar's head, without producing any powder burn or mark upon hair or scalp.

Three days after Dunbar's death, his wallet and pocket-book were found just across the unoccupied field, on an ash-heap, back of a store-house, about thirty-six rods from where the body was found. They contained no money; one of them was open and the other closed, with its strap tucked into the loop.

The testimony of the medical witnesses differed in regard to the cause of the extensive ecchymosis of the lids of the left eye and the effusion of blood about the ball. All but two thought it could only be accounted for by a severe blow upon the eye. Two, however, considered it possible to have resulted from the blow or shock of the bullet upon the back of the head, al-

though there was no fracture of the base of the skull or any injury whatever to the bones entering into the formation of the orbital cavity.

The judge's report of the inquest was very elaborate and complete, consisting of over twenty-six pages of legal cap. In conclusion, he says:

"It seems clear that the death was either a murder, with an attempt to make it appear to be a suicide; or a suicide, with an attempt to make it appear to be a murder. A careful consideration of all the facts compels me to the conclusion that Mr. Dunbar committed suicide. This theory explains all the facts but one; this exception is the injury to the left eye. The evidence leaves it doubtful whether this injury was inflicted by a blow or was the result of the shock of the bullet-wound. If the latter theory is true, then it is not inconsistent with suicide: if the former, then suicide seems impossible.

"I find and certify that George S. Dunbar of Pittsfield, Massachusetts, shortly after ten o'clock on the evening of July 4th, 1885, on Water street in said Pittsfield, came to his death by a bullet fired from a pistol, which bullet entered the back of his head, and that said pistol was discharged by his own hand.

(Signed), JOSEPH TUCKER.
Justice of the Central District Court."

The absence, at the inquest, of more positive evidence of murder, renders, of course, the finding of suicide justifiable. Yet there are circumstances connected with the case that seem to point quite positively to the conclusion that Dunbar did not shoot himself: —

(1) The black eye is incompatible with the theory of suicide.

(2) The situation and direction of the wound indicate that the revolver must have been held in a position almost, if not quite, impossible for the hand of the person shot, without causing powder marks or burns upon the hair or scalp.

(3) The fact that the pocket-books were found empty in a locality where they would naturally have been examined and left by a thief who had committed a murder and escaped through the field adjoining, a place where sufficient light could be obtained to examine the booty without being seen. If Dunbar had himself left them where they were found, he would, to escape observation, have travelled a long circuitous route from the place where he was last seen.

Besides these, there are other circumstances that might be mentioned, which militate against the probability of suicide. If he committed suicide he evidently meant to have it appear to be a murder. Upon no other theory can the long string, the fact that he was shot in the back of the head, the placing of the pocket-books, and the locality selected for the deed, be accounted for. If such was his intention, then an alert, intelligent and ingenious man, in the full possession of his faculties, laboring under no especial excitement, carefully prepared and carried out his scheme in the most bungling

and foolish manner. Why should he have attached a useless string, ninety feet long, to the revolver and left three cartridges in his pocket? On the other hand, if he was murdered, these evidences of suicide are just what would have occurred to his assassin, to throw off the suspicion of murder. Which of the two theories is the true one, time may fully reveal.

If he committed suicide it is improbable that any further evidence of the fact will ever be added to what is now known. If he was murdered, there is yet hope of the discovery of the assassin.

THE DUNBAR TRAGEDY: WAS IT A MURDER, OR WAS IT A SUICIDE?[1]

BY D. B. N. FISH, M.D., MEDICAL EXAMINER.

THIS case came under the observation of a medical examiner in a county adjoining mine, and my interest in it arose from facts learned by me during attendance at the inquest.

If, in the view here taken of it, I differ from some of my medical brethren, it is done in no spirit of criticism, for I realize the fact that it will probably never be determined by positive evidence whether this was a suicide or a murder, and that every one who forms an opinion will do it from his estimate of the probabilities in the case.

About ten o'clock on the night of the 4th of July, when the sound of a pistol-shot would attract little attention, a man was found upon a side street of a populous town, lying on the ground; the face rested on its left side, the body on the chest and abdomen. At first it was thought he was drunk; soon it was found that he was dead. On examination, a bullet-wound, which was apparently the cause of death, was discovered in the back of his head.

At the autopsy it was demonstrated that "the bullet had entered the head just under the occipital protuberance and just to the right of the median line. The skull was splintered at the point of entrance of the ball. The bullet had passed from the point of entrance upward and forward, and slightly to the right, till it reached a point a little forward of the middle of the skull, from one inch to one inch and a half, to the right of the middle line; then it passed downward, forward, and to the left at quite a sharp angle, and was found in the brain substance over the sphenoid bone, about one and a half inches from the forehead. The skull at the point of entrance was very thick, solid and fine-grained. The left hemisphere of the brain was perfectly normal. The socket of the left eye was found to contain a large clot of blood. It was impossible that the bleeding caused by the bullet should have reached the socket of the left eye. The lids of the left eye were infiltrated with blood and the eye protruded from its socket. There was clotted blood in the left nares. There was no other mark of violence. The hair was not burned nor singed, nor were there any marks of powder on the scalp, the skin or the clothing. There was no abrasion of the skin about the eye or on the face. It was the opinion of all the physicians present at the autopsy that the injury to the eye was caused by a blow on the eye." It was thought that there was no fracture of the sphenoid, ethmoid or orbital plates. The right eye was normal.

[1] Read at the meeting of February 3, 1886.

Near the body, about three or four inches from the right ankle, lay a revolver of a pattern called the "Defender," calibre-32, long; this held one metallic cartridge — a 32, short — and one empty cartridge-shell. To this revolver, by a peculiar arrangement which will be described further on, was fastened a strong hempen string, ninety feet in length. This string, or cord, passed under the right foot and was stretched out along the road for about fifty feet; it was attached to nothing but the weapon. In the left pocket of the coat were three cartridges similar to the one in the pistol. The coat and vest were buttoned. The two pocket-books usually carried upon the person were missing.

From the stand-point of the medical examiner was this a murder or a suicide?

The entire absence of powder-marks, the location of the wound of entrance, the course of the ball through the brain, and the absence of the pocket-books would seem to point to the probability of murder, while the ninety feet of string was a mystery in any view of the case. The arrangement of this string can be reproduced in the following manner: Tie a long cord, about six inches from one end, around the handle of a pistol, just back of the hammer and trigger, with a hard knot directly underneath the pistol; bring both ends of the string up over the hammer and tie in a hard knot directly over the hammer; pull the string back till it slips off the hammer, and the string, with its loop, will be seen as it was found on the "Defender." This loop could not be passed over the trigger and used for firing.

That this pistol was fired within the ordinary suicide limit is disproved by the absence of the scorchings and brandings of the powder, unless it can be shown that some intervening substance had been used, or that it is possible to hold a pistol so closely to the head that no marks of the powder would be seen. One witness stated that a hat was found pressed well down upon the back of the head; others said the hat was on the ground near the body. This hat was missing soon after the tragedy, and was admitted to have been burned by a member of the family, but the medical examiner had assured himself that there was no bullet-hole in it, nor powder-marks on it. I do not believe it possible to fire a pistol so closely to the head that some of the gases will not escape and burn the hair, but if this were possible, some unburned powder would follow the ball into the brain. No grains of powder were found in the wound, and the conclusion is obvious that this shot was fired beyond the limit of the powder-marks. It would seem impossible that one could hold a pistol at such a distance, and fire it so as to send the ball into the back of the head with the upward and forward direction seen in this case. Professor Maschka, of Prague, is quoted, in the *Medico-Legal Journal*, September, 1885, page 228, as laying down the following rule: "Certain well-known appearances, such as burning, singeing, dark discoloration, and hardening of the parts close to the wound, *must* be present for a theory of suicide." This positive statement, taken in its full apparent meaning, would leave no ground for the further discussion of this question; but Caspar has shown that suicides sometimes arrange for shooting themselves at a distance, by means of a string attached to

the trigger of a pistol, and I hope to prove that it is possible to shoot one's self with a pistol held in the hand at a distance beyond the limits of the powder-marks.

The black eye, with the extravasation of blood into the orbit, was considered the result of a blow over the eye, and, therefore, evidence of a murderous assault. The three cartridges in the pocket might have been placed there by a murderer to excite a suspicion of suicide, while the absence of the pocket-books seemed to indicate murder and robbery, rather than suicide.

What did the ninety feet of string mean? In the hands of a confederate, it might have served as a means of signalling that the way was or was not clear; or it might have been used to pull away the pistol after firing, in order that no weapon be found upon or near the murderer, should he be apprehended immediately after the shooting, or should miss his aim, or should be discovered and suspected before firing. It was not possible that the pistol had been fastened to the fence or the telegraph pole near by, and then fired by means of the cord by the man himself, for the blood from the bleeding wound of the head had not run down his body or his clothing, as it would have done had he removed any fastening of the cord or pistol after the fatal shot.

The hour and the place were each alike favorable for murder or for suicide. But if this was a murder, what was the use of the peculiar loop of the string on the pistol? By pulling back the hammer, the loop could be slipped over it and used to fire the pistol. The "Defender" has its half-cock so far back that such a loop will slip off the hammer just before it reaches the half-cock, and thus the hammer can be snapped down on the cartridge; but the force of the blow is so slight, that a cartridge can be fired only after repeated attempts. It is not credible that a murderer would use such a clumsy contrivance for firing, for the repeated snapping down of the hammer on the cartridge would be too much like sounding the burglar-alarm before attempting to break into a house.

It was suggested that the string might have been passed under the foot, and the pistol have been fired by the man himself, using the loop over the hammer. This also could be done, and the firing done with some degree of accuracy. Would any use of such a string enable one to hold and fire a pistol, with any degree of accuracy, at the back of the head, and this at such a distance that the powder-marks would not show? From former experiments of my own with revolvers similar to the one used, and from the teachings of the authorities, it seemed necessary that this pistol, with its .32-short cartridge, must be held at least twenty inches from the back of the head to be sure of escaping powder-marks upon some part of the head or neck (a conclusion which subsequent experiments with a "Defender" appear to verify); yet I was obliged to admit at the inquest that I could not then, either with or without the string, hold a pistol aimed at the back of the head at a distance greater than nine inches, and at this distance could not be sure of my aim. But later observation and experiment showed me a method of holding the muzzle of a pistol at even thirty inches from the back of the head with an

almost absolute accuracy of aim. Held in such a way, the pistol could be fired by the use of the loop over the hammer, and the string under the foot without using the trigger, but this gave no advantage either in holding or firing the pistol, for it could be fired easier and more accurately by using the trigger alone. After experimenting for a week, I pulled the loop back and well down on the butt of the pistol, and used the string under the foot as a "guy-rope" to steady the weapon. The latter was cocked and held in the right hand at arm's length, with the muzzle pointed towards the head — somewhat as one holds a pen. The butt rested on the little finger, the handle was grasped firmly between the other fingers and the thumb, and the trigger pressed against the palm of the hand. Held in this way, a contraction of the hand, so slight as to be hardly noticed, would fire the pistol. This method of using the string furnished a rest for the weapon, and its great advantage was at once apparent. The aim would be made certain by aiming the revolver at the right eye, and then turning the head half-way round. The cord would keep the hand from moving.

Here, then, is a possible method of firing the pistol with great accuracy at the back of the head, from such a distance that the powder-marks would not show, and a method reasonably accounting for the use of the loop and string. All that seems necessary to establish the probability of this use of the cord is some evidence of such use. The shoes found on the body were worn, and apparently had been recently wet. On the sole of the right shoe (under the instep), and on the left side of the shoe, were creases which can be exactly imitated by steadying a pistol with a cord in the manner above described, held between the thumb and fore-finger of the left hand. There was no crease on the outer or right side of the shoe.

Perhaps it will not be out of place to say here that it was the sight of the loop on the cord and the creases on the shoe which led me to change my belief in the murder theory to the conviction that this was a suicide, although I could not then account for the absence of the powder-marks. I do not believe that these creases, so exactly like those appearing on my own shoe after using the cord in the way I have described, were accidentally caused by pulling on the string at the time of finding the body; the pistol would not furnish resistance enough to make so well defined a mark as was found on the bottom of the shoe.

Was there anything impossible or improbable in the location of the wound, or in the course taken by the ball, provided the pistol had been held and fired in the manner described? A pistol can be aimed and fired so that the ball will strike any given point in a line from the eye to the occipital protuberance. It could be so fired that, if the ball continued its direction after striking the skull, it would make a wound similar to the one found in this case, but to do this would require a position of the head and arm that would be unnatural and strained, and therefore improbable, because there could be no conceivable advantage in trying to give such a course to the bullet. The easiest and most natural method of holding a pistol, aimed at the right

side of the back of the head, would send a ball from the right to the left side of the brain provided it was not deflected from its course. A conical ball, fired within a short distance, from a first-class revolver of medium size, will, as a rule, pass into and through the brain in a direct course, but military surgeons have recorded many exceptions to this rule.

This bullet was apparently fired from a very inferior weapon, the "Defender," many of which, like its class, will often, I may say generally, throw a ball so that it will strike wholly or partly on its side rather than on its end, and thus may make a large wound of entrance, although fired within a few inches of the head. When such a bullet strikes a rounded and unequally resisting surface, like the region of the occiput, it will be very easily deflected. Considering these facts, it seems very probable that the weapon was held in the more natural position, while the ball, deflected from its original aim, took the course described. At any rate, the location of the wound and course of the bullet do not need a theory of murder to account for them.

I do not believe the condition of the left eye was necessarily the result of any murderous assault. Black eyes, as the result of accident, are so common, and the possibilities of accident in this case so great, that I believe the condition of the left eye might be safely ignored. It was thought by some, as I have said, to have been caused by a blow over the eye, inflicted by the murderer before the shooting, and was held to be one of the stronger evidences of murder; but this seemed to me improbable even when I believed in the murder theory. If it could have been caused by a murderer's blow, so slight that it left no mark upon the face, it might equally well have been accidentally self-inflicted; or might have been caused by striking a stone or lump of earth on falling after the shot; or the men who first discovered the body and thought it that of a drunken man may have accidentally struck the toe of a boot against the eye before life was fairly extinct. Any of these things were possible, and, in my opinion, far more probable than the theory that it was a second wound inflicted by a murderer. To adopt the latter theory would be doing great injustice to a very skilful piece of work. If this was a murder it was done in accordance with a preconceived plan to make it appear a suicide, as shown by the use of the pistol of the victim (or at least one like it), by the string and its mark on the shoe, and by the cartridges in the pocket. A man capable of planning and executing such a master-piece would be very careful not to furnish gratuitous evidence of murder by inflicting an unnecessary wound of the eye, either before or after the shooting.

But there is another possible explanation of the condition of the eye which seems to me the most reasonable one, and this is that the extravasation of blood about the left eye was a part of the injury caused by the bullet. Ecchymosis of the lids with extravasation into the orbit of one or both eyes often occurs during whooping-cough, and has been seen after excessive vomiting. It is not infrequent after gun-shot wounds of the head, and has even been observed after a fall upon a carpeted floor. I have found but little written on the subject of "black eyes" from gun-shot wounds, and must con-

fess that I find no record of a case exactly parallel to this in which the effusion of blood appeared upon that side alone which was apparently uninjured. In the "Medical and Surgical History of the War,"[2] are recorded several cases in which ecchymosis of the lids was noted. Among these is the case of an unknown soldier (page 204), who was found "with a penetrating fracture of both tables of the left parietal bone at the anterior superior angle . . . the right eyelid (was) ecchymosed. A puffy swelling existed in the right temporal region . . . death ensued the same evening." In the absence of any record of autopsy it cannot be known what, if any, injury was done to the right side of the head by the ball, but the case is of interest as showing the absence of ecchymosis of the eyelids on the side known to have been injured, and its presence on the other or right side.

Lieut. Lilycrantz (page 193) "was wounded by the discharge of a pistol at a distance of about four feet from his head. The ball perforated the os frontis over the right supercilliary ridge. . . . A probe, five inches long, glided easily, by its own weight, its full length directly backward through the wound without coming in contact with the ball. . . . There was considerable extravasation in the cellular tissue of the eyelids and the pupils were dilated." In this case the ball penetrated the *right* side of the brain while the lids of both eyes were ecchymosed.

The case more nearly parallel to the one under consideration is that of President Lincoln (pp. 305, 306). The ball entered the head "about one inch below the superior curved line of the occipital bone and an inch and a half to the left of the median line of the same bone. . . . Over the left eyelid there was slight ecchymosis." This was followed by "excessive extravasation into the orbits, accompanied by great ecchymosis of the eyelids." At the autopsy it was found that "the ball entered through the occipital bone about one inch to the left of the median line and just above the left lateral sinus which it opened. . . . It then penetrated the dura mater, passed through the left posterior lobe of the cerebrum, entered the left lateral ventricle, and lodged in the white matter of the cerebrum just above the anterior portion of the left *corpus striatum*, where it was found." This was about six inches from the entrance wound. "The ventricles of the brain were full of clotted blood. A thick clot beneath the dura mater coated the right cerebral lobe. There was a smaller clot under the dura mater of the left side. . . . Both the orbital plates of the frontal bone were fractured, and the fragments pushed up toward the brain. The dura mater over these fractures was uninjured. The orbits (were) gorged with blood." In regard to this fracture of the orbital plates, Dr. Otis quotes, with approval, the opinion of Prof. T. Longmore, of Netley, from which I make the following extracts: "The ball did not strike the anterior part of the cranium yet the orbitar plates of both orbits were found to be the seats of comminuted fracture. . . . This double fracture was decided to have been caused by coutre-coup. If the term coutre-coup be limited to its precise signification of counter-stroke, that is, the impression made by

[2] Part I. Surgical Volume.

the stroke on the part of the cranium opposite to that directly struck by the ball, will the force of coutre-coup explain the fractures in this instance? . . . I am inclined rather to attribute the lesions mentioned to a transmitted undulatory stroke or sudden impulse of the brain-substance itself, against the thin bony layers constituting the orbitar plates." "The unusually thin orbital plates on either side," says Dr. Otis, "were exposed to the impulse of the cerebral pulp. Even if they were not fully protected by the dense supra-orbital ridges, it might be inferred that the force would be transmitted mainly to the right orbital region, or that opposite the entrance perforation. Whereas *both* orbital plates were fractured. That the fragments inclined upward toward the brain rather than downward and forward, was probably due to the pressure of the blood extravasated within the orbits."

It will be remembered that in the case which forms the subject of this paper, the ball struck against the right side of the vault of the cranium and was deflected sharply towards the left hemisphere of the brain. If the medical examiner had not assured himself that there was no fracture of bone at any point other than that of entrance, the condition of the left eye might have been easily accounted for on the theory that the force of counter-stroke, or if, with Dr. Otis and Professor Longmore, we reject this, the impulse given by the ball to the cerebral pulp had fractured the sphenoid, or the orbital plate of the left, if not of both orbits. It is possible that the effusion of blood appeared first in the left eye because of the position of the body, and that it might have appeared later on in the other had it not been checked by the advent of death. It will be remembered that in the case of President Lincoln, who lived nearly nine hours after the receipt of his injury, the ecchymosis appeared first over one eye, while *both* orbital plates were broken. If, in the case under consideration, we must exclude any fracture of bone, can we not safely admit the possibility that the impulse of the bullet upon the brain-substance may have ruptured some minute branch of the ophthalmic artery and thus caused the hæmorrhage?

Having shown, as I think, that every feature of the injury to the head could be produced by a suicidal shot, it is time for an estimate of the probabilities of the case. I cannot see an objection to the suicide theory that does not bear with equal weight against the theory of murder. The former seems consistent in all its parts, while the latter seems inconsistent and in some of its requirements apparently impossible.

On the theory of suicide this man, who was known to be possessed of remarkable ingenuity, who had a few months before purchased a pistol and cartridges similar to those found on the body, who is reported to have asked when buying the pistol: "where can a man shoot himself to cause instant death?" and to have been told "in the back of the head;" — this man determines to commit suicide, and to do it in such a way as to make it appear a murder. He arranges the string on the revolver in such a way that he can shoot himself from a distance that will excite a suspicion of murder, not necessarily knowing that he could fire it beyond the limits of the powder marks.

He loads his pistol with two cartridges and puts three in his pocket. He starts out and is seen on the street, but suddenly disappears from the road, or, rather, is not seen to pass a house a little further along his route; he has turned off the road to leave his empty pocket-books, folded and clasped, in plain view in the rear of a building. Perhaps he here receives an accidental injury to the eye. He then goes down to a less frequented street, drops the loose end of the string and unwinds it as he goes. Now he cocks the revolver, holds it directly out from the shoulder at arms' length, adjusts the cord and makes it taut by an almost involuntary up-and-down movement of the hands which causes the cord to crease his shoe, takes his aim by the starlight, for it was starlight, or possibly by the phosphorus from a match rubbed on the top of the barrel and sight of his pistol, turns his face over the left shoulder, presses the palm of his hand against the trigger and the deed is done.

I have been told that this scheme is too ingenious to be credible, but *somebody* thought of this method of using the string before the officers of the law came upon the scene, and if that somebody was a murderer, he had a plan which involved all this and much more. This murdered man must appear to have committed suicide, but there must be evidence on and about the body to make it appear that he had endeavored to simulate a murder. The pistol of the victim by his side, the string with its loop, the buttoned coat and vest, and the creases on his shoe (to be made after the man had fallen), will excite a suspicion of suicide, while the absence of the powder-marks will indicate that he has attempted to simulate a murder by shooting himself at a distance. How much more simple and safe to have placed the weapon to the man's head and fired. His own pistol by his side, the three cartridges in his pocket, and the buttoned coat and vest would have pointed strongly to suicide.

I have not introduced here the supposed blow upon the eye, for I do not see where, in the theory of murder, it can come in with any degree of propriety. No man holding a loaded revolver in his hand, with the intent to shoot his victim in a comparatively public place, would first knock him down, and then stand off and shoot him from a distance. If this was a murder, the assassin, after taking incredible pains to make it appear a suicide, would never have placed the empty pocket-books where they could be easily found, and thus, by his own act, arouse a suspicion of murder.

If we adopt the theory that this was a murder, with no attempt to make it appear a suicide, we have to account for the pistol owned by the victim, for the loop on the string, for the creases on the shoe — so unlikely to have been produced by accident — for the buttoning of the coat and vest at the risk of safety, after rifling the pockets, and for the folding and clasping of one, at least, of the pocket-books after taking what little money might have been in them.

I believe that the medical examiner would have been justified in reporting this as *a case of probable suicide, but one which demanded a legal investigation.*

At the inquest it was shown that the deceased was in straitened financial circumstances, and that he had an insurance on his life of $66,000.

In his summary of this case, Judge Tucker said: "It seems clear that this death was either a murder, accompanied by an attempt to make it appear a suicide, or a suicide with an attempt to make it appear to be a murder. A careful consideration of all the facts compels me to the conclusion that Mr. Dunbar committed suicide. This theory explains all the facts but one — that exception is the injury to the left eye. The evidence leaves it doubtful whether this injury was inflicted by a blow, or was the result of the shock of the bullet-wound. If the latter theory is true, then it is not inconsistent with suicide; if the former, then suicide seems impossible."

It hardly seems probable that the judge intended to exclude the *possibility* that the injury to the left eye was caused by accident, and when he says: "If the former theory — that this injury was inflicted by a blow — is correct, then suicide seems impossible," I must suppose him to mean a blow from the hand of an assassin.

The verdict was that Mr. Dunbar "came to his death by a bullet fired from a pistol, which bullet entered the back of his head, and that said pistol was discharged by his own hand."

NOTES ON THE LAWTON MURDER.[1]

BY WILLIAM H. TAYLOR, M.D., MEDICAL EXAMINER.

On December 23d, 1885, at 9.30 o'clock, A.M., I was notified that the body of a man was lying in a wagon at Plainville, about three and a half miles from New Bedford, and that the surroundings indicated a violent death. As soon as possible I went to the place, arriving about ten minutes after ten, and found an express wagon, furnished with sideboards, drawn up to the wall at the north side of the road. This road, followed west, leads to Fall River, and in its easterly course passes through the towns of Acushnet, Rochester, Marion and Wareham. The wagon was a brown one with yellow trimmings and red wheels. The dashboard, footboard, thill, axletree, whiffletree and wheel on the right side were plentifully covered with recently dried blood. On the tailboard were two bloody smooches as though produced by bloody hands in closing the board. The board which ordinarily served to increase the height of the tailboard was missing, and was afterward picked up on a road in Rochester. The hind axle was badly sprung. Attached to the wagon was a dark chestnut horse with sweat dried on him, and evidently weary and hungry. The wagon contained a dozen or so of wood-colored boxes of the capacity of half a bushel each, and having the name "Lawton" on them in stencil. Seven of these boxes were closely stowed in the forward part of the wagon and contained eggs, one of the eggs being broken. The balance of the boxes were empty, and were piled helter-skelter on the body of a man which was lying diagonally across the floor of the wagon, the head to the right near the tailboard, and the feet projecting five or six inches over the left sideboard, well forward. Before the removal of the boxes, it was noted that the wagon contained a small Japanese wolf-robe (lined with brown cloth and smooched with blood which had evidently undergone attempts at removal) and a horse-blanket, red and white checked, old and worn. A number of the boxes having been removed, the body came into view. It was that of a man thirty-five to forty years of age, rather below the medium height. The left side of the face was covered with dried blood into which dirt, and a few small, dry, brown leaves were matted, the leaves resembling those of the box-shrub. Numerous wounds were seen on the left side of the face, five being of special prominence.

At the back part of the head a wound was found from which blood was oozing on the bottom of the wagon. The body was not quite cold. Rigor

[1] Read at the meeting of June 8, 1886.

mortis was observed in the legs only. About the neck was an old tarred hemp line as large as an ordinary clothes-line, which was tied in a "granny" knot on the right side, and had the appearance of being doubled. This rope had a long free end, and exercised no constriction on the neck. The clothing consisted of a brown mixed overcoat, blue undercoat, red cardigan jacket, dark vest, white shirt and paper collar, gray-mixed trousers, underwear and stockings and black cloth boots, quilted. On the hands were brown leather gloves, well worn and bloody. All the clothing was blood-stained except the cardigan jacket, underclothes, stockings and boots. The boots were not muddy, nor was there any mud on the clothing except a spot on the back of the overcoat where it had laid on the floor of the wagon. (The day was warm for December, and the roads were muddy). In the pockets were found a cigar, a few matches, a white handkerchief and a few worthless coins, but not a cent of current money. The inspection having been completed the body was arranged in the wagon and the whole affair was sent to the morgue in New Bedford under charge of a policeman. The body was identified on the spot, by a gentleman who well knew deceased and his habits, as that of Richard N. Lawton, of Westport, Mass., by occupation a collector of eggs in the towns of Wareham, Rochester and Dartmouth. He gave valuable information as to Lawton's probable whereabouts at the time of the murder, judging from the quantity of eggs which the wagon contained, and also stated that money in some quantity should have been found in the pockets. Inquiry along the road developed the fact that several persons had seen the wagon go by at daybreak, and almost all stated that the driver was a shortish man, with a black or dark mustache. This information, collected on the spot, probably assisted greatly in the speedy arrest of the criminal. A case of murder and robbery with subsequent transportation was readily made out.

An autopsy was held at 4.05 P.M., December 23d, at Wilson's morgue. After calling attention of witnesses to the position and appearance of the body as required by law, the examination proceeded. The body was that of a well-nourished and muscular man, five feet six inches tall, and would weigh about one hundred and thirty pounds. Very little rigor mortis, if any, was present. An evacuation of the bowels of ordinary appearance had occurred. Clothing was as before described. Subject had a brown mustache, and brown curly hair with a tendency to baldness at the forehead. A piece of tarred hemp line was removed from the neck. It was eighteen feet long, and had a standing bowline tied in the end giving the appearance of a double rope around the neck. The knot was situated just to the right of the median line of the chin, and, upon testing it, the rope did not slip. Three fingers could be easily passed between the rope and the neck, and no furrow could be found on the skin indicating constriction. No marks of violence could be found externally, except upon the head. Post-mortem ecchymoses were slight. Blood was dried in the ears, nose and mouth. The left side of the face was covered with dried blood containing dirt and a few

small leaves. There were ecchymoses under both eyes. At the back part of the head on the right side near the median line, three and a half inches from the margin and just below the level of the top of the right ear, was a wound one inch by three-quarters of an inch with ragged margins, from which blood oozed. On washing the face, no powder-brand, burnt powder, or traces of wadding could be found. No wadding was found about the body or wagon. Five large wounds were situated in the space bounded by the left ear, angle of the mouth, lower jaw, malar bone, and zygomatic arch. The largest of these wounds was half an inch in long diameter, the smallest, a quarter of an inch; the remainder were between these sizes. The edges of these wounds were slightly blackened and were sharp cut. Beside these wounds there were forty or fifty small shot wounds scattered over the left side of the face. Only one shot wound was found to the right of the median line, and that was on the forehead. Several small shot wounds were seen under the chin on the left side. No wounds were found back of the left ear on the left side of the head. The small shot cut from these wounds were number seven or number eight bird-shot.

Section of the body showed that the heart was empty and contracted; the valves and walls were normal. The lungs were non-adherent, slightly emphysematous at apices, and generally anæmic. Ordinary post-mortem staining radiated outward from the bronchi to the surface. There were no subpleural ecchymoses. The bronchi of both lungs contained coagulated blood without froth. The larynx and trachea were normal. No ecchymoses were visible, and no evidences of pressure. The tongue was brown from dried blood. The hyoid bone was uninjured. There were no marks of pressure in the structures surrounding the larynx and trachea. Two buck-shot were found lying loosely in the pharynx; they had produced no injury at the site in which they were found. The liver, spleen, pancreas, kidneys, bladder and alimentary canal were normal. The stomach contained half a pint of partly digested food, in which could be distinguished beef, fowl, bread, potato, and other matters. The small intestine was the receptacle of matters which had undergone stomach digestion. The colon contained normal fæces.

The skull was extensively fractured. The charge of shot had torn through parts of the left temporal and sphenoid bones, breaking them into fragments, and carrying them into the brain. The ascending ramus of the jaw was fractured. The body of the sphenoid was fractured. Fractures radiated in all directions from the foramen magnum. A large, transverse fracture passed through both parietals at their back part, both temporals in the petrous portion, and the basilar process of the occipital. Around the wound of exit, the occipital bone was shattered to bits. Two buck-shot were found at the wound of exit. One lay just inside the skull, and one, much flattened, was between the scalp and the skull. These buck-shot, and those found in the pharynx, were weighed, with the following result: The flattened shot weighed forty-seven grains, Troy; the others, thirty-eight and a half, forty-

one, and forty-one and a half, respectively; total, one hundred and sixty-seven grains. The left internal and external carotid and basilar arteries were torn across, and the veins at the side of the neck, and the sinuses of the skull were freely opened. The large wounds of the face communicated directly with the interior of the skull through the sphenoid and temporal bones. Three fingers could be passed from the interior of the skull through this opening into the wounded region of the face. The right posterior lobe of the cerebrum was lacerated. The cerebellum was badly torn, the left hemisphere being nearly detached, and the right much lacerated. The medulla oblongata was cut through just below the olivary bodies. The spinal cord was normal. A blood-clot extended between the dura mater and the cord, from the foramen magnum to the second lumbar vertebra. The body was generally very anæmic.

Before discussing the points arising from the view and autopsy, it may be well to give an outline of the story of the murder, as brought out by the evidence accumulated by the police, and offered at the trial of Samuel F. Besse, for the killing of the man who furnishes us with the material for this paper.

Richard N. Lawton, a quiet, inoffensive man of unexceptionable habits and character, left his home in Westport, on Monday, December 21st, 1885, to take his usual route to Wareham and back, collecting eggs. He had with him probably between two and three hundred dollars. He arrived at Wareham that evening, and was seen by various persons. He passed the night at the house of Mrs. Long, who gave him his breakfast at about 8 o'clock, A. M., Tuesday, and he then started to collect eggs. He called at a number of houses, as was his custom, and, about half-past ten, left the house of Mr. Handy to go to South Wareham by a wood-road which was uninhabited for some distance, and led past Blackmore's Pond. No one, except his murderer, ever saw him alive afterward, and the next that was known of him was the discovery of his body in Plainville, on Wednesday morning, fifteen or sixteen miles from Mr. Handy's house. Samuel F. Besse, the convicted murderer, was a desperate character, living with his father in a miserable hovel and a wretched neighborhood, in South Wareham. The locality bears the fitting name of "Hogtown." He had spent a long term in State Prison for burglary, and was a terror to the neighborhood. He knew Lawton's habits and the fact that he carried money with him, and it was known that he had contemplated robbery of this man for some time. On Tuesday morning, December 22d, he left his home about eight o'clock, taking his gun and buck and bird shot of precisely the same character as those found in Lawton's head.

He waylaid Lawton as he came down the road from Handy's, and, secreting himself in the thick bushes at the side of the road, shot him. The location was determined by finding a cushion and whip belonging to Lawton near by, and upon assuming a position which it was reasonable to suppose was Besse's at the time of firing, the direction of the charge could be traced by the cut twigs of trees and bushes, and blood scattered about. Immediately after the shooting, the horse started, but, in sheering out, brought up on a tree-stump

or log, which sprung the hind-axle. Besse caught him and turned him into the short scrub-oaks at the side of the road, and, making evidence for his conviction by scrubbing the shrubs and small trees in his haste, and leaving the marks of uneven wheels on the ground, he found a good-sized tree some distance in from the road, in an unfrequented place, and tied the animal to it. This was shown by the tree being gnawed, the ground stamped and pawed, horse-droppings lying about, and a box, completing, with those found in the wagon, the original number which Lawton had on leaving home.

A most important witness for the prosecution was one Westgate, a companion of Besse's (as far as he thought prudent to be), who, at the time of the murder, was looking after some traps on the Weweantit River, an outlet of Blackmore's Pond. He was about a quarter of a mile away through the woods. He says he heard a team coming down the road, and voices. Then he heard two shots and some shouting. He looked after a few more traps, and then made his way to the road, where he met Besse. He inquired of Besse whose team it was that passed down the road, and what he fired at. Besse replied that he had seen no team, and that he had just shot a rabbit. After a little conversation on general topics, Westgate went home, leaving Besse in the road. Besse arrived home shortly after noon, and, having made some purchases, proceeded to devote his time to drinking.

He spent the first part of the night at a neighbor's, sleeping in a chair. About 3 o'clock, A. M., Wednesday, he left the house, and, going to the place where the horse was secreted, he arranged his load, and, mounting the vehicle, urged the horse at as rapid a pace as possible through the various towns to Acushnet. As he entered Acushnet, still intoxicated, day was breaking. Several people saw him, marked his intoxication and his strange load, and one or two spoke to him. As he gained the country beyond Acushnet he met more people, and, concluding probably that the region was rather populous, he deserted the horse and wagon, and made his way through the woods and fields to New Bedford, where he was seen between eight and nine o'clock. A trifle of cunning seemed to remain in his intoxicated brain, for he went over to Fairhaven (across the river from New Bedford) to await the arrival of the morning train from the Wareham region, before showing himself publicly in New Bedford. While waiting for the street-car coming from the depot, he sat in an opening of a broken fence in a drunken sleep, and was seen by a number of passers-by. About noon he returned to New Bedford, and spent money freely for clothing, liquors, and other articles, and at four o'clock took the train to Wareham, his drunken state attracting the attention of the conductor. On Thursday night, December 24th, he was arrested at a neighbor's house on suspicion, and in a short time evidence of the most convincing character fastened the crime upon him. He was tried at a special session of the Supreme Judicial Court at Plymouth, in May, 1886, and convicted of murder in the first degree. In this brief and condensed statement of fact, no special reference is made to the large amount of testimony necessary to establish the main facts as well as those of secondary importance;

nor does the evidence concern us particularly as medical men except in so far as it has a bearing on the points having medico-legal interest.

At the preliminary hearing at Wareham, shortly after the murder, and at the hearing before the grand jury at Plymouth, the medical evidence was quite fully given. At the trial, however, very little work was given to the medical examiner. The defence admitted the cause and manner of the death without question, and the conversational powers of the witness received very little encouragement. But a very few questions involving statement of opinion were asked.

In preparation for the trial, quite a number of questions worth looking at presented themselves to my mind, and may be of interest to others.

I. How long had this body been dead when found at ten minutes past ten on the morning of December 23d? The body was not quite cold, and the only rigor mortis observed was a slight amount in the legs. According to our best authorities, the body cools in fifteen to twenty hours, the process being governed by the temperature of the surrounding medium. Under favorable circumstances it may be delayed to forty-eight hours or more. Warm weather, thick clothing or coverings, and a large quantity of subcutaneous fat favor slow cooling. Cooling is hastened by slight coverings, cold weather, leanness and death by hæmorrhage. Lawton's body was lightly covered, the clothing being open to the shirt. The temperature of the air was a little above freezing. He was not fat, and he had died with extensive hæmorrhage. And yet his body was not cold, though he must have been dead twenty-three hours when I saw him. Rigor mortis usually begins at the third or fourth hour, and is complete at the fifth or sixth. Exceptionally it may be complete as early as the second hour or as late as the thirteenth. No case has been reported in which its appearance has been delayed beyond twenty-four hours. It passes off in twenty-four to thirty-six hours in summer, thirty-six to forty-eight in winter. Exceptionally it lasts only two or three hours, and may possibly continue as long as three weeks. It appears first in the muscles of the face and neck, then in those of the trunk, and finally in the arms and legs. It passes off in the same order, the legs being the last to yield. In sudden death with no fatigue and with hæmorrhage, rigor mortis is apt to come on slowly and last a long time. This was the case with Lawton, and yet we find him lacking rigor mortis except in the lower extremities. It was reasonable to believe that rigor had come on and had been broken up by handling the body and jolting it about in the wagon. To be sure of this, I had the body carefully watched by the undertaker after it had passed from my hands. No rigor appeared. From the state of the body I did not feel warranted in approximating closely to the time of death, and gave as my opinion the statement that the body had been dead not more than thirty hours.

II. What was the cause of death? Three causes, either capable of producing death, were evident: shock, hæmorrhage, and section of the medulla oblongata. As the death was instantaneous, the last cause must have been

the most important. How do we know that his death was instantaneous? This promised to be a point of some importance, but did not come up at the trial. As far as we know of instantaneous death, section of the medulla oblongata gives us the typical example. Again, the absence of froth in the bronchi, and the undisturbed coagula therein, showed plainly the method of death. Lawton's respiration ceased instantly. The heart continued to beat and pump the blood from the body as long as any came to its cavities, and finally stopped in systole. Had he breathed after being shot, we should certainly have found frothy, bloody liquid in the air-passages.

III. Could he have died from any other cause than gunshot wound of the head? What had the rope about the neck to do with his death? Fortunately, the answer is an easy one. Not one single symptom of death by asphyxia was present. The trachea and larynx, as before stated, showed no trace of injury, unusual redness or ecchymoses. The structures of the neck were normal. No furrow was found in the skin of the neck; no froth or frothy liquid in the air passages; no congestion of the internal organs. It might be of importance to say that he was not hung first and shot afterward. Had this improbable state of things happened, we should still have had congestion of the abdominal organs, as the wounds of the head, at most, would have emptied only the vessels of the head and upper extremities. The generative organs showed no evidences of anything unusual, and the tongue was not swollen or indented. What the rope was used or intended for, must remain a sealed book, unless the convicted man sees fit to tell his story.

IV. From what direction and at what distance was the fatal shot fired? How can we connect the murderer with the missiles found in the body? The small shot wounds formed an ellipse, in the centre of which were the large wounds. These wounds were all on the left side of the face, some under the chin, but none back of the ear. The charge passed through the left temporal and sphenoid bones, along the base of the skull, and emerged a little to the right of the median line at the back of the head. It necessarily follows that the charge must have come from in front, somewhat to the left, and a little below the plane of the base of the skull. It is probable that Lawton was riding slowly along with the head slightly bent downward.

Authorities, surgical and medico-legal, are by no means agreed as to the appearances of wounds of entrance and exit. In most surgical works the dogma is maintained that the wound of entrance is always smaller than that of exit. As the other extreme we find Casper, who is equally dogmatic in the assertion that the wound of exit is always the smaller. Ogston, Taylor and Tidy recognize that many circumstances influence the appearance of these wounds, and that each case may present features peculiar to itself regarding the relative size of the two wounds, and the degree of inversion or eversion, laceration, and so on. Had any question arisen in this case, the fact that fragments of the temporal bone were found in the brain near the wound of exit would have settled the matter.

Westgate says he heard two shots. If two were fired, one only could

have struck the murdered man. I conceive it to be next to impossible for a gunner to put two charges into a moving object in exactly the same relation. Again, had the first barrel missed, the victim would certainly have been disturbed and would have changed the position of his head. With regard to the distance at which the shot was fired, I have made some experiments with an old fashioned muzzle-loading fowling-piece with very long barrels, which I knew to be capable of carrying shot very closely. In trying to obtain a powder-brand I used two and three-quarters drachms of rifle powder, at various distances. Briand and Chaudé, quoted in Medical Examiner Fish's admirable paper on pistol shot wounds,[2] state that powder-brand can be obtained at a distance equalling the length of the gun-barrel. Casper puts it at three or four feet, and Ogston, quoting Lachése, gives about the same figures. I was unable to get a powder-brand in the open air at a greater distance than two and a half feet; I certainly could not obtain one at the length of my gun-barrels, nearly three feet.

Partly burned powder would stick in bibulous paper in the open air at about eight feet; whether it would adhere to the human skin at that distance, I do not know. Wadding of good tough paper, well rammed, will be thrown twelve to fifteen feet against a slight breeze, and eighteen to twenty feet with the breeze. With my gun, loaded with two and three quarters drachms of powder, one ounce number seven bird-shot, and twelve buck-shot, I could make a target closely resembling that on Lawton's head at twenty-five feet. Besse's gun was an old-fashioned double Manton with shorter barrels than mine and would probably not carry as closely. I put his distance from Lawton, at the time of firing the fatal shot, at eighteen to twenty feet.

In Besse's game-bag were found No. 7 bird-shot and 41 buck-shot, which, it was shown, he had purchased within a few days. The buck-shot were divided into groups of four, taken at random, and weighed by Professor Babcock, of Boston, who found that the fours averaged about a hundred and seventy grains. Some fours went as low as one hundred and sixty-three grains, and one, at least, over one hundred and eighty. As before stated, the four which I removed from the head and throat weighed one hundred and sixty-seven grains. An ounce of No. 7 bird-shot I found to contain from three hundred and fifty to four hundred, which would give a plenty to make the wounds of Lawton's face, as well as to cut the twigs of the trees and bushes in the line of fire. The method of loading is characteristic of an ignorant gunner, many men of this class having a belief that buck-shot will carry closer when backed by a charge of small shot.

Certain stains were found on the front of the legs of Besse's trousers. These had been subjected to attempts at removal, but not efficiently enough to ruin them for examination. The police sent these trousers, as well as a pair of boots worn on the night of transportation of the body, to Professor Babcock, of Boston; consequently, I did not see them until the day of the trial. Pro-

[2] Transactions Mass. Medico-Legal Society. Vol. I, p. 285.

fessor Babcock was fortunate enough to obtain the articles early enough to find blood-corpuscles in the stained places, and gave the very just and scientific statement that the blood was that of a mammal, that there was nothing inconsistent in the view that it was human blood, or that it was the blood of a rabbit. Certainly, where stains are sufficiently recent, the finding of corpuscles is the most conclusive test possible. I am inclined to think, however, that the time in which corpuscles can be distinguished in a blood-stain is shorter than is generally supposed, and I should place little reliance on observations made beyond a week or ten days. Some difference of opinion exists between authorities as to the value of the spectroscope in examination of blood-stains. Tidy is very enthusiastic in its favor, considers it infallible, and claims to have produced a characteristic spectrum from a stain known to be over one hundred years old. Others are more conservative, and still others assert that it is inapplicable in very many cases, requiring a good deal of technical skill, and, even in the best hands, proving unsatisfactory. I am not prepared to accept this last view. What little work I have had opportunity to do with blood has prepossessed me in favor of spectrum analysis, and, as it seems the only certain test, where it *is* clear and unmistakable, I think that hard work is well repaid which renders a man familiar enough with blood-spectra to be certain of their recognition.

Perhaps the best method to pursue with a bloodstain on cloth is that proposed by Ogston, which I will quote, with slight modification:

"The stained portion of the cloth is to be cut out and suspended by a fine thread in a test-tube containing distilled water. If the stain is from blood, the coloring matter will detach itself from the cloth in the form of reddish striæ, and collect at the bottom of the tube, while the water will there assume a red color, more or less pronounced.

"(1) A portion of the contents of the tube may now be used for the spectroscope.

"(2) Two or three drops of the fluid from the bottom of the tube may be cautiously withdrawn by a pipette, and examined under the microscope for blood-disks, epithelial-scales, or fragments of capillary-tubes.

"(3) Two or three more drops similarly withdrawn from the bottom of the tube may be placed on a slide, glacial acetic acid and a very minute crystal of common salt added, left to spontaneous evaporation, or gently heated, and when dried, examined by the microscope for crystals of hæmatin.

"(4) A little of the fluid may be dropped on bibulous paper and submitted to the guaiacum test.

"(5) A little more of the fluid, after the addition of ammonia, may be watched for any change other than a heightening of its color. If the red color comes from vegetable matters, it will be changed to blue, green, and so on.

"(6) The remainder of the fluid in the tube may be now heated, without or with nitric acid, for albumen, which, if present, will render it milky, or throw

down a coagulum from it of a dirty gray color, leaving the water without a trace of red.

"(7) The turbidity or coagulum, if from albumen, will disappear or be re-dissolved on the addition of caustic potassa, and assume a brownish-red by reflected, and a green color by transmitted light.

"(8) When the stain has arisen from a layer of blood of perceptible thickness, the cloth, after the maceration, may exhibit a soft, white, grayish or rosy adherent matter, which, when removed and placed under the microscope, will prove to be the fibrin of the blood."

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A CASE OF POISONING WITH THE OIL OF GAULTHERIA.[1]

BY J. G. PINKHAM, M.D., MEDICAL EXAMINER.

THE subject of this report was a young woman who had been married three weeks, and was three months advanced in pregnancy. On March 1st, at 9 P. M., she took, by advice of a friend, one ounce of the oil of gaultheria, for the purpose, as was supposed, of procuring an abortion. Soon after taking the drug, she complained of a bad feeling in the head and of other unpleasant symptoms. At 11 P. M., a neighboring physician was called in. At this time, the prominent symptoms were profuse perspiration, pain in the abdomen, frequent and painful micturition, and purging. Mustard was given as an emetic, with no result, except the vomiting of a little white froth. Towards morning a convulsion occurred, after which the feet remained fixed in a state of flexion. At 7 A. M., March 2d, Dr. C. A. Lovejoy, to whom I am indebted for the clinical history of the case, was summoned to take charge of it. He found the patient tossing about in the bed, and apparently suffering from severe pain. She was totally insensible to light, and nearly so to sounds. The body was bathed in perspiration, face flushed, respiration rapid, pulse extremely feeble. Shortly after the doctor's arrival, a large amount of urine was passed involuntarily. The treatment was stimulating. At 10 A. M., the symptoms remained the same, except that the pulse was stronger. A short time before noon, she again passed a large quantity of urine in bed. Death occurred, without return of consciousness, at 12 M., fifteen hours after the ingestion of the poison.

The autopsy was made at 10 A. M., March 3d, twenty-two hours after death, Drs. Lovejoy and Sheldon assisting. There was no rigor mortis, except a slight degree of it in the jaw and left knee. The feet were drawn into the position of talipes equinus. The fingers and toes were flexed, and the thumbs drawn into the palms of the hands; when these members were straightened, they resumed their flexed position at once after the extending force was removed. Corneæ hazy. Pupils half dilated. Buccal mucosa pale. The edge of the tongue appeared to have been bitten. Abdomen flat; recti relaxed. Breasts full; areolæ distinct; on pressure, a fluid like colostrum exuded.

On section of the body, the blood was found to be very black, and, with the exception of a few small clots in the large veins, to be everywhere fluid. The liver, spleen, and the posterior portions of the lungs were engorged with black blood. Externally, and on section, the kidneys appeared to be deeply congested, but otherwise healthy. The pericardial sac contained about two drachms of

[1] Read at the meeting of February 2, 1887.

fluid. Heart healthy. The uterus was dark posteriorly near the fundus; it was enlarged to about the size attained at the end of the third month of gestation. The right ovary contained a corpus luteum of pregnancy. The mucous membrane of the stomach, and that of the duodenum for a distance of four inches from the pylorus, were intensely congested; below this point in the small intestines, the evidences of irritation gradually diminished. The contents of the stomach and intestines had a strong odor of checkerberry. The brain and all other organs examined were normal in structure.

To sum up the facts in this case, we have, as the result of taking one ounce of the oil of checkerberry, distress in the head, profuse perspiration, pain in the stomach and bowels, purging, diuresis, with frequent, painful, and at the last, involuntary micturition, abolition of sight and hearing, general convulsions, tonic spasms of the flexors of hands and feet, great depression of the heart's action, rapid respiration, and death in fifteen hours. *Postmortem*, we find persistent spasm of hands and feet, great irritation of the gastro-intestinal mucosa, a black, fluid state of the blood, and congested kidneys.

The oil of checkerberry (gaultheria procumbens) is said to be composed of methyl-salicylate nine parts, and a hydro-carbon called gaultherilene, one part. I am not aware that these substances have been separately studied, but it is highly probable that the active properties of the drug are due to the methyl-salicylate, which is one of the series of methylic ethers, and would seem entitled, from this fact alone, to be ranked among the poisons. It may be obtained artificially by distilling a mixture of two parts of crystallized salicylic acid, two parts of anhydrous wood spirit, and one part of oil of vitriol. When obtained in this way, it has the characteristic appearance and odor of the oil of checkerberry procured by distillation from the plant — a fact which would add still further to the probability that, in considering these cases of poisoning, methyl-salicylate is the substance with which we have to deal. Poisoning with the oil of checkerberry appears to have been rare. Beck[2] speaks of a fatal case that occurred in New York in 1832. Toxic effects have been known to follow large doses of an infusion prepared from the leaves of the plant. But, in the limited research which I have been able to make, I have found detailed reports of only three cases of poisoning with the oil.

The first case was reported by Dr. Gallaher:[3] A boy, aged nine, took a tablespoonful of the drug just before supper. Symptoms: early and persistent vomiting, purging, pain and tenderness in epigastric and hypochondriac regions, a hot skin, rapid pulse (125), slow, laborious, and loud respiration, inordinate appetite for food, thirst, increased pulsation of carotids, great dulness of hearing, a parched and swollen mouth. There was no delirium or stupor. The eyes were red, but the pupils remained natural. Recovery took place after treatment with small doses of calomel, blood-letting, and blisters over stomach and bowels.

[2] Medical Jurisprudence, Vol. II, p. 942.
[3] Philadelphia Medical Examiner, 1852, n. s. Vol. VIII, p. 347, et seq.

The next case was reported by Dr. Allan McLane Hamilton.[4] The patient was an adult female, and the amount taken was one-half ounce. The symptoms, as described by the doctor, who saw her an hour after she had taken the poison, were dizziness, drowsiness, marked delirium, pain in the head, noises in the ears, like the buzzing of bees, disturbed vision, hallucinations, left hemiparesis, a hot head, strong pulsation of temporal arteries and veins, contracted, then dilated pupils, cold extremities, rapid and labored respiration, restlessness, salivation. There were no marked gastric or intestinal symptoms. The patient had a strong inclination to sleep, and could only be kept awake by slapping, the use of galvanism, etc. The case ended in recovery.

The third case was reported by Dr. Jewett.[5] The patient was an intemperate man, aged fifty-five, who took by mistake, at 12 M., one-half ounce, as nearly as could be ascertained, of the oil. The symptoms, which began very soon, were severe pain in the stomach and bowels, burning heat, intolerable thirst, vomiting and purging, perspiration, labored respiration, gradually failing sight. The hearing remained unimpaired, and the mind clear until 4.45 P. M., when delirium set in, followed by complete unconsciousness at 5 P. M. As sight failed, things at first looked pale green, then dark green, then black. At 4 P. M., sight was lost. The case ended in death. This patient took, of his own accord, some infusion of tobacco to produce vomiting, a circumstance which doubtless modified the symptoms, and may have contributed to the fatal result.

These cases prove that the oil of gaultheria, when taken internally, is highly irritant to the gastro-intestinal mucous membrane, and that it exerts a powerful influence upon the nerve-centres. As a poison, it must, therefore, be classed among the narcotico-irritants. As a remedy, it has been prescribed in rheumatism. The "National Dispensatory" and Wood's "Therapeutics" speak of the use of the plant as an emmenagogue. It is doubtless upon this theory of its action that its reputation as an abortifacient, like that of other aromatics, is based. It probably has no just claim to this distinction; but the oil certainly resembles the abortifacients in this, that when taken in decided doses, it is pretty sure to kill the mother. It is stated in the "United States Dispensatory" that the oil of gaultheria is sometimes adulterated with chloroform. If this is so, it is possible that some of the neurotic symptoms ascribed to it in the cases which have been reported may have been due to this impurity.

[4] New York Medical Journal, 1875, Vol. XXI, p. 602-605.
[5] New York Medical Gazette, 1867 and 1868, Vol. I, p. 380.

NOTE ON AN ANOMALOUS ARRANGEMENT OF THE LARGE VEINS OF THE NECK.[1]

BY J. G. PINKHAM, M.D., MEDICAL EXAMINER.

In making an examination of the body of the young colored woman who was recently killed in Lynn, by a razor wound of the neck, an anomalous arrangement of the large veins of this region was discovered, which it seems to me worth the while to describe and place upon record. The cut began one inch in front of the angle of the jaw on the left side, and extended obliquely downwards and forwards a distance of two inches, to the top of the thyroid cartilage, thence parallel to the lower jaw on the right side, a distance of two-and-a-half inches. The structures divided were the skin, the subcutaneous cervical muscle, the superficial layer of the cervical fascia, and the sterno-hyoid muscles. The thyro-hyoid muscle of the right side and the thyroid cartilage were cut into. At the bottom of the wound on the right side, and far out, was seen a large vein partially severed and still bleeding. From its position, this was at first supposed to be the external jugular vein; but when followed upwards with a probe it was found to divide into two main branches, one of which passed upwards and inwards to the region of the jugular foramen, and the other upwards and outwards to the front of the ear. Below, the main vein was found to dip beneath the sterno-cleido-mastoid muscle, and to join the subclavian, forming with it the innominate of that side. Further dissection revealed the carotid in its sheath with the pneumogastric nerve, in their usual positions, but with no vein accompanying them. It was therefore concluded that the internal jugular vein, in descending from its point of origin, had abandoned its place by the side of the internal carotid, and turning outwards towards the surface, had joined the external jugular to form a common jugular, which from this point pursued a course downwards midway between the course of the external and that of the internal jugular, until it joined the subclavian. This common jugular, although loosely invested with fibres from the cervical fascia, was entirely outside and above the sheath of the carotid. In order to make sure of my conclusions, I followed the bloodvessels upwards from the *vena cava descendens*, and laying them open verified every point. The arrangement on the left side was found to be the same as on the right, except that the vessel was smaller. As the cut was higher in the neck at this point it struck the vein in its most superficial position, and completely severed it. Had it not been for this unusual arrangement of the large veins, it is possible that the cut, severing as it would have done, only the external jugulars, might not have caused death, or at any rate might have proved less speedily fatal. As it was, death occurred from hæmorrhage in about twenty minutes, as nearly as could be ascertained, after the infliction of the wound.

[1] Read at the meeting of February 2, 1887.

A CASE FOR THE MEDICAL EXAMINER.[1]

BY S. D. PRESBREY, M.D., MEDICAL EXAMINER.

On Saturday, June 11, 1887, I was visited by a young man, who resides in a farming-district about ten miles from Taunton. He wished to notify me of a sudden death and to ask for investigation, since he had been informed by the physician who had been called, that such was the proper course. From my visitor I learned in substance the following facts. The dead body was that of a young woman twenty-one years of age, who had been living as a domestic in his father's family. The family consisted of his father, an elderly man, whose wife had been dead two years, and his brother, unmarried, about twenty-five years of age. He himself, and his two sisters, all married, lived in the vicinity. This domestic came into the family seven years ago, and at first acted as assistant, but at the death of his mother became the housekeeper. She had relatives in Ireland, and one sister, who was then on her way to this country, was daily expected. She had no relatives in this country except an aunt, with whom she was said not to have been on good terms. My informant and all the members of the family with whom I afterward conferred, spoke in the kindest terms of the young woman, and from no one of them could I learn anything unfavorable, either as to her character or her ability.

On this Saturday forenoon my informant was at work with his younger brother, the one mentioned above, planting upon their father's farm. His father was not at home, having gone out of town on business. The young woman had attended to her household duties as usual, and was supposed to be preparing to go with his sister to a neighboring city to do some shopping. At 11.30 the young man went to the house to get seed for planting, and on entering the house he heard groans, which appeared to come from a room in the second story. He went up-stairs as he says, and found the door of the girl's room locked. The groans continued and he got no answer to his repeated calls. Failing to fit the lock with any keys which he had with him, he forced the door open and found the young woman quite naked, sitting in a wash-tub partly full of water, leaning back and unconscious. He placed her upon her bed, covered her with blankets and at once notified his brother, his sister-in-law and his sisters, who all live not far from his house. A physician was summoned, but before he arrived, and within a few minutes after having been placed upon the bed, she ceased to breathe.

This history was given by the young man and was evidently accepted by

[1] Read at the meeting of October 5, 1887.

all members of the family as correct, nor has any doubt been thrown upon it by anything that has been since learned.

The room and its contents had been left for my inspection, exactly as found. The young woman's clothes were lying upon a chair, there was soiled water in a wash-tub, soap-dish with soap stood near, towel was handy, and in short the room justified the opinion that she was in the act of taking a bath.

The body showed no marks of violence, and from the view and inspection no satisfactory theory of the cause of her death could be formed. A conference with the selectmen of the town, to whom the above report was made, resulted in a request that an autopsy be made, and if necessary a chemical analysis of organs. After the necessary preliminaries, on Sunday morning the autopsy was made, of which the following is the report. Twenty hours after death, rigor slightly marked; body, full and round; pupils, evenly but not widely dilated; slight "black-and-blue spot" upon the middle of the left clavicle; front of body pale; back, purplish red; no froth or bloody matter about mouth or nostrils; external orifice of vagina patulous, easily admitting two fingers; hymen not seen; rugæ of vagina, coarse and hard; nothing more learned by inspection.

Internal examination. Cut surface of scalp bloody, and an excess of fluid blood found in veins and sinuses, especially in dependent portions; nothing abnormal in the brain; incisions show no traces of air in the circulation; trachea lined with a delicate coat of bubbling mucus, not bloody; lungs, spleen, liver and kidneys engorged and of dark color, more especially in dependent portions; large veins filled with dark liquid blood, no clots found. The large vessels about the heart were carefully tied. The heart was small and soft, but otherwise apparently normal, and quite empty. The uterus was removed with its appendages and the upper part of vagina; the os uteri was entirely plugged with mucus, not bloody, and never having been disturbed; uterus about four and a half inches long and three inches wide at the fundus; the membranes were unruptured, and contained liquor amnii and a fœtus measuring from head to caudal curve one and three-quarters inches; the umbilical cord was not spiral; the interior of the uterus showed no marks of violence; the right ovary contained a distinctly marked corpus luteum; other organs normal in appearance.

Portions of the brain, liver, kidney and the stomach complete were sent to Dr. William B. Hills of the Harvard Medical School for examination. The following is his report:

"I have completed the analysis of the organs of—— ——and do not find anything to account for death. The stomach contained one-half ounce of semi-fluid brownish contents which from microscopic examination were found to be composed in great part of remnants of food, namely, fat, starch, partly digested muscular fibre and more or less vegetable tissue the exact nature of which could not be determined. The contents of the stomach contained

also a small amount of sulphate of iron. The presumption is, I think, that this was taken in the form of a pill, with perhaps aloes or something similar. I think I am right in believing that such pills are sometimes taken under the impression that they will cause abortion. At any rate I have met with two cases in which such pills (containing sulphate of iron) have been administered by abortionists for this purpose. I do not think, however, that there is the slightest reason for supposing that the sulphate of iron was the cause of death. The amount present was small, and there was no evidence of any inflammation of the mucous membrane of the stomach.

"Chemical analysis of the stomach and contents showed the absence of all the *ordinary* poisons. The tests for most of the substances employed as abortifacients are not so well-defined as those for the ordinary poisons, and for detecting them we have to rely to a considerable extent on the microscopical examination, being aided at times by the odor. I did not, however, discover anything on microscopical examination which suggested the use of any abortifacient which may be detected in this way, and there was no indication to the sense of smell of any of the essential oils, neither could any essential oil be detected by chemical analysis.

"I think I should add, in order to make the report as complete as possible, that at one point on the mucous membrane of the stomach, was a slight brown deposit, and a portion of the deposit was sulphate of iron; I could not determine the nature of the remainder. There was nothing characteristic about it when examined beneath the microscope, and analysis threw no light on its nature. I think it was some vegetable substance; and there is a large number of these for which there are no known tests. It was the occurrence of this deposit, which led me to think that the sulphate of iron was administered in pill with some organic substance."

"(Signed) WILLIAM B. HILLS."

After careful deliberation upon the facts of this case, it was thought best to submit the following return, "that —— ——came to her death by natural causes, the exact nature of which was not disclosed, autopsy and chemical and microscopical analysis giving only negative results."

Though we were unable to arrive at an exact diagnosis in this case which we could record with a conviction of its absolute accuracy, several theories of the cause of death came up for consideration.

First, the theory of poisoning, whether accidental or intentional, would seem to have been set aside by the examination of Dr. Hills, and his report lends weight to the idea that she was only using ordinary and simple means to induce the appearance of her menses, such as the aloes and iron and the warm water sitting-bath.

Again, our history of her position and condition when found, rests entirely upon the evidence of one person, who might possibly be an interested party. The circumstances, however, seem to corroborate his statements. Yet, if in the face of his statements and of the circumstances, we were to consider

the possibility of death by smothering and arrange the evidence in order, we should find fluid blood in the larger veins and sinuses; lungs, spleen, liver and kidneys engorged; no clots; bubbling mucus, not blood-stained, in the trachea; no blood about the mouth and nostrils; heart quite empty (even the right heart); and no appearance of subpleural ecchymoses — a condition that would hardly warrant the diagnosis of death by smothering.

Taylor describes a mode of death which he calls syncopal-asphyxia, in which the symptoms substantially as above mentioned may be expected, and it seems worthy of consideration whether a pregnant woman, anxious as to her condition, hurrying through her work (to be in readiness to go out with a friend), and immediately sitting in a tub of warm water, may not become faint, and leaning helplessly backwards over the edge of the tub, may she not become so exhausted that nature may fail to rally, even if the body has been placed in a horizontal position before respiration has ceased? I am not prepared to say that this theory of the cause of death is quite satisfactory, yet I have been unable to suggest a theory that meets the circumstances of the case any more fully.

THE MEDICAL EXAMINERS' WORK DURING THE YEAR 1886.[1]

BY SAMUEL W. ABBOTT, M.D.

THE returns of the Medical Examiners of Massachusetts to the Secretary of the Commonwealth include all deaths occurring in the State which require a medico-legal investigation. These comprise all deaths of an accidental, violent or suspicious nature, and may properly be classified into deaths by homicide, suicide and accident. To these must be added a considerable number of deaths from natural causes, which from their sudden character, or from some attending circumstances of a more or less suspicious nature, or in consequence of the entire absence of apparent causes are properly referred to the medical examiner, in order that he may determine whether death was, or was not, caused by violence.

The present law, by which the entire charge of the primary investigation in cases of death by violence was entrusted to educated medical practitioners, who, from their previous training are competent to decide as to the causes of death, was enacted in 1877 with the entire abolition of the Coroner's Inquest Law, which had for centuries been the method of medico-legal inquiry among most English-speaking nations.

Not only was the office of coroner abolished, but also the jury, and the diminished expense, together with greater accuracy of investigation, has proven the undoubted superiority of the new system as compared with the old.

During the ten years since the enactment of the present law, about thirteen thousand cases have been investigated by the Medical Examiners of Massachusetts, and during the first years after the inauguration of the new system, returns of deaths were voluntarily made to the Massachusetts Medico-Legal Society, and were compiled and published in their annual volumes of transactions. The original returns from which these reports are made, comprising several large volumes, are now in the possession of that society. The work being entirely voluntary, was not complete, and comprised only about three-quarters of the cases for the years in which the returns were made. By the enactment of the present law the returns are made obligatory, and are deposited with the Secretary of the State, after the close of each calendar year.

On examination of these returns, it appears that the whole number of cases examined in 1886 was 1,378, as compared with 1,278 in 1885. Of this number 47, or 2.41 per cent., were deaths from homicide, as compared with 3.52 per cent. in 1885. There were 181 deaths by suicide, or 11.38 per cent. of

[1] Read before the Massachusetts Medico-Legal Society, October 5, 1887.

the whole number investigated, as compared with 14.17 per cent. in 1885. From accidental causes or negligence there were 678 deaths, or 49.17 per cent., as compared with 44.37 per cent. in 1885.

From all other causes, including alcoholism and various natural causes, there were 496 deaths investigated, or 36 per cent., as compared with 37.94 in 1885.

Homicide.— Of the 47 deaths registered under this class, 6 were caused by shooting, 3 by stabbing, 2 by other weapons (one of which was by blows upon the head with an axe and the other with a spade), 10 were by blows, 1 by smothering, 7 by poisoning (of which 5 were by arsenic, 1 by strychnine and 1 by tincture of opium), 5 were caused by criminal abortion and 18 by infanticide.

Two of the deaths included in this class were excusable homicide, as decided by the inquests in those cases, one being a case of homicide in self-defence, and one by an insane person.

Suicide.— Of the 157 deaths by suicide, 38 were by shooting, 16 by cutting throat, 4 by railroad collision, 27 by drowning. 39 by hanging, 28 by poison. The poisons employed were: Arsenic, 13 cases, including 7 deaths by "Rough on Rats" and 4 deaths by Paris green; opium in its different preparations, 6 cases; cyanide of potassium, 2 cases; strychnine, 2; phosphorus, muriatic acid, chloroform and bromide of potassium, 1 each.

The mortality from suicides in Massachusetts per 100,000 of the living population was 8 for the period of twenty years, 1877–1886; the least ratio in any year being 5.6 per 100,000 in 1867, and the greatest 9.9 in 1881.

The mortality from this cause in foreign countries was as follows as compared with the living population.[2]

	Deaths per 100,000 of the Population.			Deaths per 100,000 of the Population.	
	Minimum.	Maximum.		Minimum.	Maximum.
Italy . . .	2.5	5.0	Saxony . . .	25.7	41.6
France . .	11.2	18.0	Thuringia . .	21.8	40.3
England . .	6.1	8.0	Austria . . .	6.4	12.4
Scotland . .	3.1	5.0	Hungary . .	4.5	6.5
Ireland . .	1.2	2.5	Switzerland .	19.5	24.8
Prussia . .	12.1	19.1	Spain . . .	2.6	3.6
Bavaria . .	8.1	14.3	Sweden . . .	7.3	10.5

As compared with the total mortality per 1,000, the deaths from suicide in Massachusetts varied from 3.3 per 1,000 in 1872, to 5.2 per 1,000 in 1877, with an average of 4.1 per 1,000 for the twenty years, 1867–1886.

[2] Prof. L. Bodio. "Confronti Internazionali, 1865-1883." Rome, 1884.

The mortality from this cause in the principal foreign countries was as follows as compared with the total mortality.[3]

	Mortality per 1,000 Deaths.			Mortality per 1,000 Deaths.	
	Minimum.	Maximum.		Minimum.	Maximum.
Italy . . .	.9	1.8	Saxony . . .	8.3	14.9
France . . .	3.5	8.1	Thuringia . .	8.9	16.8
England . .	2.7	4.0	Austria . . .	1.6	4.2
Scotland . .	1.4	2.5	Hungary . .	1.2	1.8
Ireland . . .	.7	1.3	Switzerland .	8.1	11.6
Prussia . . .	3.8	7.6	Spain . . .	·6	1.2
Bavaria . . .	2.5	4.6	Sweden . . .	3.7	6.1

Sex.— Of the 157 persons reported by medical examiners as having committed suicide in 1886, 126, or 80.3 per cent., were males, and 31, or 19.7 per cent. were females, as compared with 81.2 and 18.8 per cent. in 1885.

The statistics of foreign countries as compiled by Prof. Bodio are as follows, — ranging from 70 per cent. of males in Scotland to 86 per cent. Switzerland : —

Suicides. — Percentage of Males.

Italy	79 per cent.	Saxony	81 per cent.
France	78 "	Thuringia	81 "
England	75 "	Belgium	84 "
Scotland	70 "	Denmark	78 "
Ireland	73 "	Switzerland	86 "
Russia	82 "	Norway	77 "
Bavaria	80 "	Sweden	78 "

Age.— On examining the statistics of suicides further, it appears that five persons committed suicide under the age of 20 years, or a ratio of .6 per 100,000 of the living population of that age-period of life.

For the period 20 to 30 years there were 26 suicides, or 6.7 per 100,000 of the population of that age-period.

For the period 30 to 60 years there were 84 suicides, or 12.6 per 100,000. For the period of 60 years and over there were 40, or 24. per 100,000.

Accident or Negligence.— Of the 678 deaths of this class, the most numerous subdivison was that of deaths by railroad accident, 227 in number, in all of which an investigation by the medical examiner is required by law (Public Statutes, chapter 26, section 13, and chapter 112, section 208). The unus-

[3] Prof. L. Bodio. "Confronti Internazionali, 1865-1883." Rome, 1884.

ual ratio of railroad accidents in Franklin County was due to the serious accident at Bardwell's Ferry. By horse railroads, other vehicles and horses, there were 30 deaths (1 of which was by a tricycle, 2 by steam fire engines and 16 by carts and wagons). There were 10 accidental deaths by fire-arms, 22 by machinery (of which 10 were by elevators). There were 27 by burns, scalds and explosions, and 94 by blows, falls and falling bodies.

By asphyxia there were 221 deaths, of which 190 were by drowning. There were also 4 deaths by foreign bodies in the windpipe, 1 by inhaling the gas of a charcoal kiln and 1 from the vapor of ammonia.

There were 27 deaths by weather agencies, including 7 by cold, 4 by heat or sunstroke, 4 by lightning and 12 by exposure, including shipwreck.

There were 18 deaths by accidental poisoning, including 2 by arsenic, 5 by opium, 2 by oxalic acid, 1 each by oil of gaultheria, podophyllin, tincture of aconite, bichloride of mercury and canned corn. In the case of death from podophyllin, 66 grains were taken, an apothecary having mistaken the abbreviation gr. ss., for grs. 66.

Causes not due to Violence.— Of this class, the number of deaths referred to the medical examiner for investigation was 496, or 36 per cent., as compared with 37.9 per cent. in 1885. Of this number, 233 were from apoplexy and heart diseases, or 47 per cent. of this class, as compared with 187, or 38.8 per cent. in 1885.

There were 54 deaths ascribed to alcoholism, and the same number in 1885.

Of the other deaths, chiefly due to natural causes, 13 were from phthisis and hemoptysis, 14 from pneumonia, 65 from causes incident to birth, 37 from unknown or ill-defined causes and the remainder from minor causes having but little medico-legal significance.

Autopsies.— The number of autopsies conducted in 1886 were 202, or 14.7 per cent. of the cases investigated, as compared with 27 per cent. in 1877, 23.9 per cent. in 1878, 22.7 in 1879, 23.4 per cent. in 1880, 18.7 per cent. in 1881, 21.2 per cent. in 1882, 17.8 per cent. in 1883 and 19.8 per cent. in 1884.

Expenses of the Present System.— The accompanying table presents the actual expense of conducting the medical examinations for the year 1886, including the cost of registration.

In order to ascertain the entire cost of executing this law for the year 1886, both as to its medical and legal requirements, it will be necessary to add to the total amount expended for medical examinations and registration ($18,024.22), the cost of conducting the inquests in the various municipal and district courts of the different counties.

Fortunately we have in the transactions of the Medico-Legal Society (No. 4, 1881, page 204) a careful resumé of the expenses of the system for a period of three years (1878, 1879 and 1880), in which it was stated that the

Expenses of the Medical Examinations provided for by the Medical-Examiner Laws of Massachusetts, 1886.

COUNTIES.	Number of Cases.	Autopsies.	Fees of Medical Examiners.	Mileage.	Witnesses and Clerks.	Chemists and other Experts.	Burial, Removal, Recovery and care of Bodies.	Incidentals.	Totals.
Barnstable . .	14	5	$ 195 00	$ 31 85	$ 37 00	$ 50 00	$ 3 00	$ 0 55	$ 317 40
Berkshire . .	59	7	470 00	50 10	36 00	—	2 00	—	558 10
Bristol . . .	88	7	615 00	52 80	49 00	50 00	155 50	1 31	923 61
Dukes . . .	4	2	69 00	1 20	22 00	—	—	—	92 20
Essex . . .	180	16	1,290 00	67 70	123 00	25 00	94 00	3 50	1,603 20
Franklin . . .	39	3	270 00	31 30	30 60	—	4 00	—	335 90
Hampden . .	105	4	620 00	65 40	40 00	—	165 00	56 00	946 40
Hampshire . .	18	—	90 00	7 40	—	—	—	—	97 40
Middlesex . .	223	29	1,840 00	91 00	242 00	350 00	111 00	7 31	2,641 31
Nantucket . .	8	—	40 00	5 70	—	—	20 00	1 60	67 30
Norfolk . . .	58	4	390 00	31 90	28 00	100 00	17 00	—	566 90
Plymouth . .	28	3	215 00	16 90	23 50	45 00	15 00	—	315 40
Suffolk . . .	453	110	6,500 00	240 00	764 00	316 00	476 00	—	8,296 00
Worcester . .	101	12	805 00	73 70	82 00	—	88 00	—	1,048 70
Totals . .	1,378	202	$13,409 00	$766 95	$1,477 10	$936 00	$1,150 50	$70 27	$17,809 82
								Registration, . .	214 40
									$18,024 22

cost of conducting an inquest was $14.50, as the average for the counties outside of Suffolk and $7.26 for Suffolk County. The average for the whole State, estimated from the whole number of inquests being $12.11. The average number of inquests for a year has been quite uniformly 20 per cent. of the views. The estimated cost of 276 inquests in 1886, at $12.11 each, was $3,342,36, which, added to the cost of medical examinations, makes the total cost of execution of the law $21,366.58 for the year 1886.

Under the coroner laws, the cost of executing the law for three years (1874, 1875 and 1876) was found to be $63,712.04, and under the new law $54,-509.31 for the three years 1878, 1879 and 1880; a decrease of $9,202.73, notwithstanding the increase of population.

Allowing for the increase of population at the same rate as prevailed from 1875 to 1885, the cost of conducting the same inquiry under the old coroner system as applied to the work of 1886, would have been $25,402.00 making a difference in favor of the new system of $4,035.42.

The principal reasons for this lessening of expense are found in the abolition of the jury and in the decrease in the number of inquests. The ratio of inquests to cases investigated under the old law was 40 per cent., while, under the present law, for a period of ten years (1877–1886), it has been but 20 per cent., or one-half as many.

The cause of this lessening of the number of inquests may be discovered in the appointment, to fill the offices formerly held by coroners, of men whose education necessarily fits them for the work which they are expected to perform. Under the old law, a man found dead, even without the least suspicion of violence, as in a simple case of heart disease, or apoplexy, would in all probability be reported to the village coroner, provided the most common marks of post-mortem discoloration were noticed by some bystanders, such marks being often interpreted by the popular mind as significant of a violent death. Hence, the coroner sets in motion the cumbrous machinery of his office. In the first place, he sends for a constable. The constable summons a jury. The witnesses come next, and last of all the nearest physician is summoned, whose evidence satisfies the assembly that the man died a natural death.

Under the working of the present law, the order of procedure is reversed. The medical officer first views the body, and in a case like the foregoing, simply reports it as a view, with a charge of five dollars and mileage. If, however, he believes there is a reasonable suspicion of violence, as revealed by the evidence shown him from an external examination of the body, and upon personal inquiry of the witnesses, and also by an autopsy, if that be found requisite, the case is reported to the proper authorities for inquest.

The tests to which the law has been subjected have thus far shown it to be less expensive, less liable to the perpetration of fraud and more efficient than the coroner laws which it has superseded.[1]

[1] Transactions of Massachusetts Medico-Legal Society, No. 4, 1881, p. 207.

The following cases are published as illustrative examples of the work of the medical examiners — a portion of them being selected as presenting features of peculiar interest, either of a medical or a legal nature : —

124. D C., aged 40. Autopsy at 10.40 A. M., July 18, 1886. Case of Homicide by Punctured Wounds of Face, Neck, Shoulder, Chest, Abdomen and Thigh.

[*Extract from Inquest Finding.*] — "The said D. C. had occupied above place as a laundry for several months, and he also resided in the same rooms. The place consisted of a front room used for a laundry and a back room used for a sleeping-room, fitted up with bunk for sleeping and other furniture for cooking and laundry purposes. He was a quiet, industrious person of about forty years of age, of Chinese extraction. His place was usually frequented in the evening by other persons of his race who remained until a late hour. Occupants of an adjoining tenement as well as neighbors in another house saw him about twelve o'clock in the night of July 17 in his place with two other persons, and conversation between such persons was heard in his place by said occupants until about two o'clock in the morning of July 18. A man of Chinese race was seen to leave the front door of the place of the deceased who acted in a suspicious manner, and wore his clothes in such a manner as to conceal his identity, but, as he was seen before the death was ascertained, and by a citizen not acting in an official capacity, no definite action could be taken by reason of this circumstance. Between six and seven that morning, a bloody footstep, made evidently by a Chinese shoe, was seen upon the threshold of his doorway. Then an entry was made into his premises by the front door, against which the body of the deceased was found lying dead ; the body was cut in several places, as described in the autopsy, and was still quite warm. The indications about the body tended to show that he had gone to sleep upon a temporary bunk near the front window, while some other person had occupied his bunk in the back room. There was no evidence of any struggle. The trunk of deceased in the back room had been ransacked and some money taken. Evidently the said D. C. was murdered by some person who occupied the room with him that night, and it was done to cover the evidence of the theft of his money."

Autopsy. — Body still retained some warmth. Rigor mortis well developed before autopsy was finished. Punctured wounds : (1) at left angle of mouth ; (2) an inch below left angle of mouth ; (3) through left cheek ; (4) a second wound through left cheek ; (5) in left side of neck ; (6) in left side of neck again, just above level of shoulder ; (7) at tip of left shoulder ; (8) just to right of umbilicus ; (9 and 10) in front of left thigh ; (11 12 and 13) on back of left hand.

No. 1 penetrated alveolar process of upper jaw, cut through the tongue and nearly amputated the uvula. No. 2 went through the lower jaw, splitting its body down to symphysis at chin. No. 3 perforated the left ramus of lower jaw. No. 4 divided cheek and took course inward and downward to spinous process of fourth cervical vertebra. No. 5 cut through the skin, sterno-mastoid, left side of thyroid cartilage, left common carotid and internal-jugular, left side of œsophagus and into body of fifth cervical vertebra. Nos. 6 and 7 were superficial. No. 8 wounded adominal parietes and opened the ileum at two points, extensively cutting omentum also. Wounds 9 to 13 were superficial. Abdominal cavity contained ten fluid-ounces of blood. Heart healthy, empty, contracted. Lungs, spleen, kidneys, and pancreas, very anemic. Stomach contained a partly digested meal of rice and other food, measuring seven ounces ; the gastric mucosa was very pale. Liver was normal. Bladder was half full of urine. Brain was pale, with a moderate degree of hypostatic injection.

No arrests made at date of this report (Dec. 1886).

149. J. L. S., aged 16. Case of Inanition, resulting from Uncontrollable Vomiting.

In the morning of July 5, 1886, a boy, playing with other boys "celebrating" the day, discharged a small pistol, loaded with blank cartridges, into the face of this girl, many grains of powder entering the skin of the left cheek, the nose and upper lip ; a few powder grains entered the conjunctiva and the mucous membrane of the lips. There was no serious wounding of the face, and a surgeon, called at once, proceeded forthwith to extract the grains of powder : this was done at two or three sittings, the first one continuing about two hours. The girl was not very strong, and had had some gastric trouble within the previous year. The face healed rapidly, only a slight degree of inflammation with moderate suppuration resulting. Within a week vomiting set in ; this continued to develop until at length all nourishment by the stomach was suspended and nutritive enemata was used alone. Sometime after the vomiting, and after the face was fully healed, chills began to occur at irregular intervals and these continued with more or less severity to the end. There was slight fever. No diarrhæa, jaundice, swelling of joints, or pulmonary symptoms ; the mind was clear, but depressed throughout. Emaciation was extreme, and death by inanition occurred at 3.40 A. M., Sept. 19. Being unable to establish a connection, as cause and effect, between the shooting and the death, from the medical and other testimony at hand, I so reported to the district attorney. The grand jury indicted the boy for an assault before the girl's death ; under direction of the court, it took testimony after the death to determine if there was basis for an-

other indictment, but adhered to its first finding. To this the boy plead guilty; but later, under advice of council, withdrew this plea. Meanwhile, the district attorney, deferring to the wishes of the girl's parents and family physician, who were dissatisfied with the indictment, and wished a graver charge made out, brought the case again before the grand jury; after hearing the testimony of five physicians, one of whom was unable to connect the shooting with the cause of the death, while all the others were uncertain in their opinion, the grand jury unanimously voted to stand by its first indictment.

J. O'B., aged 45. Viewed Oct. 24, 1886, at 3.20 P. M. Autopsy Oct. 25, 1886, at 9 A. M. Death from Cerebral Hemorrhage (Caused by a Blow or Fall).

This man, intemperate, while somewhat under the influence of alcohol, repaired to a livery office in town and engaged in quarrel with ———. Witness saw ——— strike or push O'B. who was then seen to fall to the ground. He was picked up in an unconscious state and expired almost instantly. P. was held for murder.

Autopsy. — Seventeen hours after death.

Inspection. — Man of medium build and fair development of muscle. Rigor mortis marked. Right eye normal, left eye destroyed some time prior to his present injuries. Swelling one-half as large as a common-sized hen's egg a little below and to the left of occipital protuberance. Very slight abrasion of skin on throat, right wrist and both hands. Slight ecchymosis on right arm, back of neck and below right clavicle.

Internal Examination. — Considerable effusion of blood beneath the scalp in the occipital region. A careful removal of calvaria reveals extreme meningeal congestion. Upon removing the dura, there is a copious flow of blood. Whole surface of brain shows great congestion, but most marked over left hemisphere.

Quite a firm clot one-half size of a chestnut is in the left ventricle; clots a little softer in texture in the anterior lobes of both hemispheres, but more marked in the right at a point directly opposite the external swelling above described. All other organs of the body found normal except stomach, liver and left kidney. Stomach internally reddened and congested in spots. Liver appears normal in texture, but weighs four and a half pounds. Left kidney is congested. Urine contains small amount of albumen.

Death from hemorrhage of brain caused by external violence.

Inquest. — P. was held for manslaughter, tried at the January court, convicted and sentenced to four years' imprisonment.

5. Unknown, aged 50. Viewed July 1, 1886, at 5 P. M. Death from Strangulation by Hanging.

I was summoned by telephone at 3.30 o'clock P. M., July 1, 1886, to come at once to the summer residence of ——— where a messenger would meet me and conduct me to the place where the body was found. I went at once, arriving at the place designated at 4.30 P. M., where I found a police officer and also the boy by whom the body was discovered. I found the body about two-thirds the way up the hill, fully ten minutes' walk from any road or path whatever, in the bushes, lying upon the face, with a small rope tied tightly around the neck, and broken off about two inches from the knot which was just behind the left ear. The rest of the rope was fastened around the trunk of a small tree in a crotch formed by a limb, which was broken off about a foot from the tree.

His hat lay in the underbrush near the foot of the tree — a common worn straw hat. The body was that of a man about fifty years old, very cheaply dressed, shoes much worn. He lay flat upon his face, and the fall had turned the nose to the right side. The tongue was partially out of the mouth and slightly bitten. The whole body was in an advanced state of decomposition, very much discolored and offensive, distended with gas which was given off at the slightest motion. In the left inner breast pocket of his coat was a "New Testament and Psalms" in very fine print, in which was a folded piece of paper upon which was written in pencil, "This will Cirtify that I was in my Wright mind." In several places upon the margins of the leaves, and also on the fly-leaf portions of the paper had been cut out, as if to remove names. There was also in the right pocket of the pantaloons an old-fashioned, small, wooden-handled, single-bladed knife, upon the handle of which the letters "F. R." were cut, also two keys on a ring and a small bit of lead pencil. There was nothing beside this. After viewing the body I delivered it to the chairman of the selectmen who was present at the view, and issued a certificate to the undertaker. After conference with the district attorney he thought it advisable to hold an inquest and so instructed me. I therefore notified the trial justice to hold an inquest as provided by statute.

42. G. E. D., aged 22. Viewed March 25, at 4.23 P. M. Autopsy at 9.45 A. M., March 27. Suicide by Cyanide of Potassium.

D., a young man addicted to "sprees," engaged in one of these, with a companion named S., through the day of March 24th, and again in the morning of March 25th. In the course of the morning last-named, D. declared his intention to commit suicide. Together the men went to three druggists to buy cyanide of potassium, but failed. Then they parted, but came together again and

went to D.'s room; D., meanwhile, having bought a quantity of the cyanide at a reputable druggist's under false pretences (to clean brass). At the room, S. saw D. put the poison in its dry state in his mouth while lying on his bed, after saying to him, "I'm going to finish up," and "Goodbye, Al; I'm gone." Presently D. fell from the bed to the floor and then S., coming to his senses and getting measurably sobered and alarmed, called for help; but D. was dead when help arrived.

Autopsy. — Much lividity of dependant parts and sides of neck. Eyes very bright. Labial mucous membrane rosy red. At corners of mouth, on front of chin and within the lips and on upper surface of tongue were many white glistening particles of the cyanide (which had been taken into the mouth and pulverized by the teeth). Heart gorged on the right side with dark fluid blood, containing only one or two loose, small, dark clots. Lungs engorged; a few subpleural punctate ecchymoses on posterior surfaces. Spleen and kidneys engorged. Intestines not remarkable; in their contents were some white slimy particles (cyanide). Liver moderately injected. Œsophagus deeply reddened throughout, Stomach nearly empty, emitting a faint odor of almonds; fundus much reddened. Tongue, pharynx and larynx were deeply injected, of a bright vermillion color. Brain not remarkable; no hyperæmia. Chemical analysis resulted in conclusive reaction for hydrocyanic acid in the tongue, stomach, heart, blood, kidneys, spleen and brain, — the heart, blood, kidneys, and spleen especially; none in intestines and liver.

S. was charged with being accessory to the suicide and was arrested, but the grand jury did not indict him.

41. M. N., aged 27. Autopsy at 9 A. M., Nov. 23, 1886. Case of Acute Red Atrophy of Liver.

This woman had been beaten by her husband some two weeks before her death. It was claimed by her and her friends that the injuries received at his hands were the cause of her death. She was about the house and even on the street for six or seven days after this trouble, when she took to her bed, soon became deeply jaundiced and died.

Autopsy thirty hours after death. — Body fairly well nourished. Pupils a little dilated. There is a black and blue spot under the left eye, but no other external mark of violence. Skin everywhere of a bright yellow color. On opening the great cavities, the tissues are seen to be of the same yellowish color.

The stomach is greatly dilated and, together with the small intestines, is distended with gas. On removing the sternum, on its upper third there is seen a large reddish spot caused by the infiltration of blood in the tissues generally. The tissues in the anterior mediastinal space are also infiltrated with blood. The pericardium is normal in appearance. The right side of the heart is moderately full of black fluid blood; there are a number of hemorrhagic spots beneath the pericardium along the line of juncture of right auricle and right ventricle, and two or three of these are of the size of the finger-nail, — the others are smaller; section through one of these spots shows the clot to be of a yellowish red color, firm and nearly the third of an inch thick. Right auriculo-ventricular opening admits three fingers; there is a small black clot in the left side. Left auriculo-ventricular opening admits two fingers; the valves are healthy and all the cavities are of normal size; the muscular substance is of a yellowish color, and the cut surface appears opaque; microscopic examination shows this tissue to be very granular, and also that it has lost its striated appearance.

Left lung slightly adherent at top, heavy; the bloodvessels are distended with black blood, and a quantity of bloody frothy fluid can be squeezed from the cut surface; the bronchi are partly filled with the same fluid. Right lung like left, except that it is free everywhere and this same fluid flows from the cut surface.

In the pleura covering the chest, along the spine from the second to the sixth ribs on the right side, are a number of large black spots, some nearly an inch in length and irregular in outline; section shows these spots to be due to an effusion of blood beneath the pleura. Beneath pleura covering the diaphragm of right side are a number of large spots of the same character. Pleura of left chest clear and glistening and everywhere of same color. The mucous membrane lining trachea is smeared with a red frothy mucus; the tissues about it are infiltrated with blood. Mucous membrane of œsophagus is of a grayish white color. Spleen large, of a bluish color and a little softer than normal.

Left kidney of a general bluish color, — capsule strips off readily. Section shows cortical portion to be of a grayish color and a little thicker than normal. Right kidney much like the left, except the pelvis is a little dilated and somewhat infiltrated with blood. Bladder contains about eight ounces of normal urine. Stomach distended with gas, its mucous membrane of a grayish white color, contains about three ounces of fluid in which are some solid particles. The duodenum contains a quantity of light slate-colored gelatinous matter.

The liver is almost half the usual size, soft and flabby, found on the back part of the abdomen; on removal, no blood flows from the cut vessels and none can be squeezed from the cut surface; the organ is everywhere of a dark red color, and the cut surface is of the same uniform color; the lobules cannot be made out; its surface is fairly firm although it looks extremely soft; microscopic examination shows the cells to be completely destroyed and to be replaced by fat and molecular

broken-down matter. The gall-bladder contains about an ounce of dark thick bile. Pancreas of a uniform grayish color, normal in size and appearance.

Tissues about portal vein normal in appearance. Small intestines contain a small amount of matter, the product of digestion; they are everywhere of a grayish white color. Large intestine contains a few small fæcal masses. Vagina rather large, walls rather flabby and of a pale reddish color. The os uteri is irregular in outline, and there are two quite deep fissues, one extending wholly across the neck, and the other part way; these are covered with mucous membrane. The cavity of the uterus is about 2½ inches deep and this, as well as the ovaries and tubules, is normal in appearance.

The dura is of normal thickness and is clear and glistening on its inner surface. Vessels of the pia and surface of the brain moderately full of blood. On removing the brain there is a quantity of bloody fluid left in the basis cranii. Vessels of the base of the brain moderately full of blood, and there is a soft grayish clot in about the middle of the basilar artery, not adherent and easily removed. Section of the brain and great ganglia shows nothing abnormal.

189. G. F. E., aged 31. Viewed at 12.50 A. M., November 26. Autopsy at 10.25 A. M., November 26. Homicide by Punctured Wounds of the Heart, Pulmonary Artery, Aorta and Lungs.

In the evening of November 25 (Thanksgiving day), at about 10.15 o'clock, E. became involved in an altercation with his brother-in-law, E. K., both men being moderately under the influence of liquor, and the cause of the quarrel being E.'s intemperance. The collision occurred in E.'s kitchen, adjoining his bedroom, and the whole affair was witnessed by his wife (K.'s sister). The dispute presently subsided in great measure, and K. asked E. to "make up and be friends." E. made an insulting reply. Whereupon K. seized a carving-knife from the kitchen table and stabbed E. as he stood at the threshold of his bedroom. E. fell at once to the floor and made no further resistance or outcry. K. followed his first blow with the knife with five others while E. lay on the floor. He then took a light into the bedroom, looked at E.'s body, said, "He's only in a fit," waited while his sister dressed herself and her child to go out, accompanied them to his mother's, talked freely there about "killing George," secured some money and went out expressing his intention of surrendering himself in the morning. Mrs. E. immediately thereupon went out in search of an officer, and finding two patrolmen not far away, one went back with her to the room where her husband lay dead, while the other quickly overtook K. and arrested him.

Autopsy. — Marked pallor of skin without livid discolorations. The front of the chest presented six penetrating wounds as follows: —

1. Under the middle of the left clavicle, a wound widely gaping, 2¼ inches long, passing through skin and muscles, dividing the third rib, made a flap-shaped wound at periphery of left lung, 1½ inches long, and ½ inch deep, cut obliquely across inner surface of fourth and fifth ribs, passed between the fifth and sixth ribs close to the spine, penetrated the muscles of the back and made a wound of exit in the back, ¼ inch long, between the angle of the scapula and the spine.

2. A little outside the line of the nipple and 2½ inches above that point was a wound an inch long which penetrated the chest-walls between the fourth and fifth ribs and made a superficial wound of the left lung 1¼ inches long and ¼ inch deep.

3. Three and a half inches from the left nipple, nearly over the middle of the sternum, a wound, 1⅝ inches long, divided the skin and muscles, the third left costal cartilage, transfixed the lung, making a peforated wound of that organ 4 inches deep, and was arrested between the eighth and ninth ribs (left) near the spine.

4. In a line with left nipple and 4 inches below it, a wound measuring externally 1⅜ inches entered the left pleural cavity, penetrated the diaphragm, wounded the spleen and the pancreas, again punctured the diaphragm and entered the left pleural cavity and was arrested close to the spine after a partial section of the eleventh rib at that point.

5. Close to the right border of the sternum and a little above its vertical centre was a wound which, measuring 1½ inches externally, entered the right cavity of the chest, partially dividing the econd right costal cartilage and wholly dividing the third costal cartilage, opened the pericardium, passed between the aorta and pulmonary artery close to their origin, wounding both vessels, and terminated between the seventh and eighth ribs an inch to the left of the spine.

6. At a point 1¾ inches to the left of the right nipple was a wound 1¾ inches long, which passing through the skin, muscles, fourth right costal cartilage, penetrated the left border of the right lung where it overlapped the heart, opened the pericardium, perforated the right auricle and ended near the spine on its right side behind the base of the heart (right auricle).

All these wounds, except the one marked 4, took direction downward and toward the left: No. 4 passed slightly toward the right; externally, their direction was nearly parallel. The deepest wound was No. 1; it measured 8 inches from entrance to exit.

In the left pleural cavity were twenty-two fluid ounces of blood; and in the right pleural cavity were thirteen fluid ounces.

The organs of the chest and abdomen were pale and exsanguine; in other respects they showed

no abnormal appearance. The odor of alcohol was perceptible when the body was opened. The heart and bloodvessels were empty of blood. The stomach contained partly digested food. The brain and its membranes were healthy.

K. was indicted for murder, plead guilty to murder in the second degree and received a life sentance.

29. Tenacity of Infant Life. C. H., aged one month. Viewed at 9 A. M., February 13th. Autopsy at 11 A. M., 13th. Case of Inanition following Exposure to Cold.

On Jan. 31st, this child was exposed to cold, being left by its mother in an alley where it remained all night and most of the following day. It was apparently dead when found and was brought to Station 2 and thence taken to the undertaker's where, after a time, it showed signs of life. I proceeded to use restoratives and after some hours' hard work, succeeded in getting it into fair condition, when it was taken to ——— Home, and subsequently was given back to its mother. Its vitality, however, had been too much impaired, and it gradually sank and died on the 12th.

Autopsy showed great loss of fatty tissue. Skin hung in folds; the eyes were sunken. All the organs were pale and anemic, but showed no evidence of disease.

Inquest. — Verdict of homicide. Mother taken on probation. She was a poor, ignorant girl, and claimed that she had put the child where she did expecting that the police would find it and take it to some home. She had previously tried to have it taken by various institutions.

31. C. H., aged 40. Viewed Feb. 28th, at 4 P. M. Autopsy at 11 A. M., Feb. 29th. Case of Oxalic Acid Poisoning, Illustrating the Hindrance to Medico-Legal Investigation produced by the Use of Embalming Fluids.

This man was given by mistake a dose of what is supposed to have been oxalic acid instead of Epsom salts. The drug was given to the wife of the deceased by a neighbor, as the wife was about to go and buy the salts.

The *Autopsy* was of little value and the same is true of the chemical analysis, as the body had been enbalmed with a preparation containig zinc, arsenic, etc.

APPENDIX.

AN ACT RELATING TO MEDICAL EXAMINERS.

Be it enacted, etc., as follows:

SECTION 1. Section twenty of chapter twenty-six of the Public Statutes is hereby amended to read as follows: — The medical examiner upon the completion of his autopsy in any case arising under the provisions of this chapter, or upon the conclusion of his view or medical examination when an autopsy is deemed unnecessary, shall deliver the dead body, upon their claim therefor, to one or more persons hereinafter named; and they shall be entitled thereto as follows: — First, the husband or wife, as the case may be. Second the next of kin. Third, any friend of the deceased. But if the dead body is unidentified or unclaimed for a period of not less than forty-eight hours following the view thereof, the medical examiner shall deliver the body to the overseers of the poor of the city or town wherein it is found lying, and said overseers shall decently bury the same in accordance with the provisions of section seventeen of chapter eighty-four of the Public Statutes.

SECT. 2. Section twenty-four of chapter twenty-six of the Public Statutes is hereby amended so as to read as follows: — Every medical examiner shall return an account of the expenses of each view or autopsy, including his fees, to the county commissioners having jurisdiction over the place where the examination or view is held, or in the county of Suffolk to the auditor of the city of Boston, and shall annex to his return the written authority under which the autopsy was made. Such commissioners or auditor shall audit such accounts and certify to the treasurer of the county what items in such account are deemed just and reasonable and such items shall be paid by said treasurer to the person entitled to receive the same.

SECT. 3. Section seventeen of chapter eighty-four of the Public Statutes is hereby amended by striking out the words "except such strangers as are buried by medical examiners under the provisions of section twenty of chapter twenty-six."

SECT. 4. This act shall take effect upon its passage. [*Approved May* 26, 1887.— Chapter 310 of the acts of 1887].

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APPENDIX.

A. SUGGESTIONS FOR THE MEDICO-LEGAL EXAMINATION OF DEAD BODIES.

REPRINTED FROM THE REGULATIONS ADOPTED BY THE CROWN OFFICE AT EDINBURGH, SCOTLAND, TO BE OBSERVED IN CRIMINAL AND OTHER INVESTIGATIONS.[1]

In the following suggestions we have not attempted to lay down full and minute instructions for the complete examination of dead bodies in all possible medico-legal cases; because such a plan would involve a statement of many long details, of which every medical man ought to acquire a competent knowledge in the course of ordinary study and practice, and especially in performing ordinary dissections for discovering the signs of disease. We have thought it of more importance to confine our attention to points which are of essential consequence in judicial investigations, or which are apt to be neglected in common dissections.

It will be remarked that we propose to turn the attention of the medical inspector to some points which are often inquired into, not by him, but by magistrates or other official persons, not of the medical profession, — such as the place where the body is found, its position when first seen, surrounding objects, the clothes, the history of cases of suspected poisoning, and the existence of poison in a house, etc. This we have been led to do, because we have had occasion to observe that on such points important articles of evidence have been overlooked, owing to the absence of a medical man, to whom alone their importance would have been apparent. On the whole, however, such matters would probably be best investigated by a law officer with the aid of a medical man.

I. General Duties.

. . . . . .

(4.) It is desirable that the medical inspectors shall have an opportunity of viewing the body before it is undressed, or moved from the spot where it was

[1] Through the courtesy of Professor Douglas Maclagan, of Edinburgh, the Massachusetts Medico-Legal Society has received a copy of the code of regulations governing the proceedings of legal and medico-legal officers in Scotland in their criminal and other investigations. This code includes an appendix containing, among other matters, a series of suggestions for the medico-legal examination of dead bodies; these "suggestions," prepared by three Scotch professors and medical jurists of distinguished and world-wide reputation, are so comprehensive in their character, and are so well adapted to aid Massachusetts medical examiners in the performance of their official duties, that the Committee on Publications takes pleasure in fulfilling the society's instructions to reprint them in this form.

first found. If the body has been previously removed or meddled with, they ought to inform themselves accurately as to its original position. In many cases, it is material that they personally visit the place where it was first seen; and they should inquire minutely into all the particulars connected with the removal of it.

(5.) In cases where the body has been buried, and disinterment becomes necessary, it ought not to be removed from the coffin except in presence of the inspectors. In any case where subsequent investigations may involve a search for poison in an exhumed body, one or two pounds of the soil immediately above the coffin should be secured for analysis.

(6.) When a considerable period has elapsed between death and disinterment, the inspection must, in all cases, be proceeded with, although the body be found in a state of decay, unless the inspectors can positively say that the progress of decay is such as to render the examination nugatory in relation to its special objects. The degree of decay which will justify such an opinion will differ with a variety of circumstances which cannot be properly specified here. It may be observed, however, that where injuries of the bones are to be looked for, or the traces of certain poisons, it is scarcely possible to assign the limit at which an inspection must of necessity be fruitless. It is of moment to remember that the internal organs are often in a great measure entire, although the external parts are much decayed. The dissection, where the body is putrid, will be rendered less annoying to those present by sprinkling the surface of the body with a solution of chloride of lime (one part in forty), or of carbolic acid (one part in thirty); but none of these disinfectants should be applied after the dissection is begun, especially in cases where there may afterwards be an examination for poisons.

(7.) No one should be allowed to be present at the examination out of mere curiosity; and we recommend that every one not engaged in the inspection, but who is in attendance to give information, or for any other purpose, and who may afterwards become a witness, should remain in an adjoining room. The medical inspector often furnishes good tests of the value of other evidence in the case; and it is therefore desirable that the general witnesses should not have an opportunity of knowing what is observed in the dissection of the body.

(8.) The examination and dissection of the body should not, if possible, be commenced without sufficient daylight in prospect to allow the whole inspection to be made without artificial light.

. . . . . .

(13.) When any portions of the body, or any substances found in or near it, are to be preserved for further examination, they ought never be out of the custody of the inspectors or of a special law officer. They must be locked up in the absence of the person who keeps them. When they are to be transmitted to a distance (which is to be done by the hands of an authorized individual, not by sending them by a public conveyance), the vessels containing them should be secured and sealed upon the spot. A label ought to be attached to each vessel, bearing a list of the articles therein contained, and dated and signed by the inspectors. Narrow-necked vessels and bottles may be secured by corks and wax impressed by a seal; wide-mouthed jars and other

vessels, if large corks cannot be had, are best secured by tying them over with sheet gutta percha, fortified, if requisite, with leather. It is important to observe that the covers are securely tied and sealed, so that the coverings cannot be removed and replaced without either cutting the strings or breaking the seals. . . . . .

III. External Aspect and Examination of the Body.

(16.) The importance of the external examination and the particulars to be chiefly attended to in performing it will vary in different cases with the probable cause of death. It comprehends an examination: 1. Of the position of the body when found, as well as of all external injuries or marks presented by it. 2. Of the vicinity of the body, with a view to discover the objects on which it rested, or from or upon which it may have fallen; marks of a struggle; signs of the presence of a second party about the time of death or after it; weapons or other objects, the property or not the property of the deceased; the remains of poisons; marks of vomiting; and where marks of blood are of importance and doubts may arise as to their really being blood, the articles presenting them must be preserved for further examination. 3. Of the dress, its nature and condition, stains on it of mud, sand, or the like, of blood, of vomiting, of acids or other corrosive substances; marks of injuries, such as rents or incisions. Where injuries have been inflicted on the body, care should be taken to compare the relative position of those on the body and those on the clothes; and where stains, apparently from poison, are seen, the stained parts are to be preserved for analysis. 4. Of ligatures, their material and kind, as throwing light on the trade of the person who applied them, the possibility or impossibility of the deceased having applied them himself, their sufficiency for accomplishing their apparent purpose, etc.

(17.) Inspectors will commence the examination of the body itself by surveying the external surface and openings. Before cleaning it, they will examine it on all sides, not neglecting the back, as is often done, and look for marks of mud, blood, ligatures, injuries, stains from acids and the like, foreign bodies, or injuries within the natural openings of the body, namely, the mouth, nostrils, ears, anus, vagina, and urethra. If there are impressions of finger-marks, they will consider which hand produced them. If there be any doubt about stains being blood, the skin presenting them must be preserved for analysis. If there be acid stains, or other probable remains of poison, or any foreign matter the nature of which may require to be determined by analysis, these must also be preserved. The ordinary places for the impressions of ligatures are the neck, the wrists, the ankles, and the waist. The degree of warmth of the trunk and extremities, the presence or absence of cadaveric rigidity, and whether it exists equally in the upper or lower extremities, should be noted in this stage of the proceedings; in other cases, the progress of putrefaction, as indicated by the odor of the body, the looseness of the cuticle, the color of the skin and formation of dark vesicles on it, the evolution of air in the cellular tissue, the alteration of the features, the softness of the muscles, the shriveling of the eyes, the looseness of the hair and nails.

(18.) In this part of the examination, it will sometimes be necessary to observe the particulars by which the body may be identified. These are numer-

ous; but the most important are the stature, the degree of plumpness, the size and form of the nose and mouth, the color of the eyes and hair, the state of the teeth, warts, nævi, deformities, scars of old abscesses, ulcers, and wounds.

(19.) The body is next to be washed, if necessary, and the hair of the head shaved, or at least closely cut; and a thorough examination of the whole integuments is to be made. At this stage, the inspectors will look particularly for the appearance of lividity, noting its chief seat and its relation to the posture in which the body was found; for impressions on the skin of objects on which it had rested; for marks of injuries, more especially contusions, taking care to ascertain their real nature by making incisions through the skin; for marks of disease, such as eruptions, ulcers, and the like; for marks of burning; for marks of concealed punctures in the nostrils, mouth, external opening of the ears, the eyes, the nape of the neck, the arm-pits, the anus, the vagina, and beneath the mammæ or scrotum; in infants, also in the fontanelles and the whole course of the spine. At this stage, wounds and other injuries should be carefully examined according to the directions given in Division V. (*Infra.*) Where the injury may have caused loss of blood, the presence or absence of pallor in the skin, lining membrane of the mouth and the gums, ought to be noted.

IV. Dissection or Internal Examination of the Body.

(20.) In commencing the dissection of the body, it must be laid down as an invariable rule that all the great cavities should be examined, and also every important organ in each, however distinctly the cause of death may seem to be indicated in one of them. It is right to examine the cavity of the spine, and, at all events, its upper portion, in any case where an unequivocal cause of death has not been discovered elsewhere.

. . . . . .

(22.) The inspectors should begin with that cavity over which there is a wound, or other mark of injury. Or, if there be an injury on the extremities, the dissection ought to commence there. In the absence of any such guide, that cavity should be taken first where the circumstances of death, so far as they are ascertained, may lead the inspectors to expect unusual appearances. In other cases it is best to lay open the chest and abdomen, to take a general survey of the parts exposed without disturbing them materially; or to proceed to the head, which may be examined thoroughly in the first instance; afterwards to examine carefully the chest and belly; and the spine may be reserved till the conclusion. Wherever unusual appearances are discovered in the first cursory survey, the anatomical examination ought, in general, to be begun there.

. . . . . .

(29.) It is necessary to examine the pharynx and gullet, the larynx, trachea and its greater ramifications, the lungs, the heart, and the great vessels with particular care, because here are most frequently found the causes of sudden natural death. In examining the heart each auricle and each ventricle ought to be laid open by an independent incision of its parietes, and this should not intersect any of the valvular openings of the septum cordis.

. . . . . .

(31.) In inspecting the organs in the chest a cursory examination should be first made by turning them over, ascertaining the nature and measuring the quantity of effused fluids, feeling for tumors or other diseases, and opening the pericardium to obtain a view of the heart. The most convenient course to pursue next is, without moving the heart from its place, to lay open its several cavities, in order to judge of the quantity and state of the blood in both sides of that organ, and then to remove the whole organs in the chest, namely, the lungs, heart, and gullet, together with the parts dissected downward from the throat, in one mass, and to examine them in detail on a table. But previously a ligature should be applied on the gullet just above the cardiac orifice of the stomach.

. . . . . .

V. Examination in Cases of Wounds and Contusions.

(33.) In a post-mortem examination the most approved mode of examining these injuries is, if they be situated over great cavities, to expose the successive structures in the manner of an ordinary dissection, observing carefully what injuries have been sustained by the parts successively exposed before they are divided. Wounds ought not to be probed, especially if situated over any of the great cavities. The depth of a wound is best ascertained by careful dissection and exposure of the parts involved; but after this is done the thickness of the tissues penetrated may be measured by the probe.

(34.) The seat of the wounds must be described by actual measurement from known points, their figure and nature also carefully noted, and their direction ascertained with exactness.

. . . . . .

(36.) Apparent contusions must be examined by making incisions through them, and the inspectors will note whether there be swelling or puckering of the skin; whether the substance of the true skin be black through a part or the whole of its thickness; whether there be extravasation below the skin or in the deeper textures, and whether the blood be fluid or coagulated, generally or partially; whether the soft parts below be lacerated, or subjacent bones injured; and whether there be blood in contact with the lacerated surfaces. By these means the question may be settled whether the contusions were inflicted before or after death.

. . . . . .

(39.) In the course of the dissection of wounds, a careful search must be made for foreign bodies in them. When fire-arms have occasioned them, the examination should not be ended before discovering the bullet, wadding, or other article, if any, lodged in the body; and whatever is found must be preserved. When the article discharged from fire-arms, or when any other weapon, has passed through and through a part of the body, the two wounds must be carefully distinguished by their respective characters, especially as regards their comparative size, inversion or eversion, smoothness or laceration of their edges, their roundness or angularity, and the comparative amount of bleeding from each. In gunshot injuries, the presence or absence of marks of gunpowder should be noted.

(40.) When wounds are situated over any of the great cavities, they ought not to be particularly examined till the cavity is laid open; and in laying open the cavity, the external incisions should be kept clear of the wounds.

(41.) When the discolored state of a portion of the skin is such as to render it doubtful whether it is due to injury or to changes after death, an incision should be made to ascertain whether there is blood effused into the textures, constituting true *ecchymosis*, or merely the gorging of the vessels of the skin, or discoloration from infiltration of the coloring matter of the blood, which takes place in depending parts of a dead body. The term *suggillation* should be avoided, as it has been used in opposite senses by Continental and British authors. The respective expressions "discoloration from extravasated blood' and "lividity after death" are preferable.

VI. Examination in Cases of Poisoning.

(42.) In examining a body in a case of suspected poisoning, the inspectors should begin with the alimentary canal: first, tying a ligature round the gullet, above the cardiac orifice of the stomach, and two round its pyloric end; then, removing the stomach and whole intestines; next, dissecting out the parts in the mouth, throat, neck, and chest in one mass; and, finally, dissecting the gullet, with the parts about the throat, from the other organs of the chest. The several portions of the alimentary canal may then be examined in succession.

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(44.) The medical inspectors may afford most important aid to the law officers in investigating the history of cases of supposed poisoning. For this purpose minute inquiry should be made into the symptoms during life, — their nature, their precise date, especially in relation to meals or the taking of any suspicious article, their progressive development, and the treatment pursued. It is impossible to be too cautious in collecting such information; and, in particular, great care must be taken to fix the precise date of the first invasion of the symptoms, and the hours of the previous meals. The same care is required in tracing the early history of the case, when the inspector happens to visit the individual before death; and, if suspicions should not arise till his attendance has been going on for some time, he ought, subsequently to such suspicions, to review and correct the information gathered at first, especially as to dates. All facts thus obtained should be immediately committed to writing.

(45.) Besides inspecting the bodies and ascertaining the history of the case, the inspectors may afford valuable assistance to the law officers in searching for suspicious articles in the house of the deceased. These are: suspected articles of food, drink, or medicine; the vessels in which they have been prepared or afterwards contained; the family stores of the articles with which suspected food, etc., appears to have been made. All such articles must be secured, according to the rules in Section 13, for preserving their identity. In this examination, the body, clothes, bed-clothes, floor, and hearth should not be neglected, as they may present traces of vomited matter, acids spurted out or spilled, and the like.

. . . . . .

(48.) The whole organs of the abdomen must be surveyed, but particularly the stomach and whole tract of the intestines, the liver, spleen, and kidneys, the bladder, and, in the female, the uterus and its appendages. The intestines should in general be slit up throughout their whole length; and it should be remembered that the most frequent seat of natural disease of their mucous membrane is in the neighborhood of the ileo-cæcal valve, and that, next to the stomach, the parts most generally presenting appearances in cases of poisoning are the duodenum, upper part of the jejunum, lower part of the ileum, and rectum.

. . . . . .

(51.) The stomach and intestines should be taken out entire, and their contents emptied into separate bottles. If the stomach or part of the intestines present any remarkable appearance, examination may be reserved, if convenient, till a future opportunity; but in every instance, it must be preserved and carried away, as it may itself be an important article for analysis. The throat and gullet may be examined at once, and preserved with their contents, which, if abundant, may be kept apart in a bottle. In addition to the alimentary canal and its various contents, portions of the solid organs of the body ought to be secured for analysis. The most important are the liver, spleen, and kidneys. A part of the liver, at least a fourth part, should be secured in every case of supposed poisoning; and in cases where the fatal illness has been of long duration, and therefore only traces of the poison may remain in the body, the whole liver, the spleen, and both kidneys should be secured. A portion of the blood, especially when the odor of any volatile poison is perceived, should be at once put into a bottle, closed by a good cork or stopper.

. . . . . .

VII. Examination in Cases of Suffocation.

(54.) In cases of suspected drowning, the inspector will observe particularly whether grass, mud, or other objects be clutched by the hands, or contained under the nails; whether the tongue be protruded or not between the teeth; whether any fluid, froth, or foreign substances be contained in the mouth, nostrils, trachea, or bronchial ramifications; whether the stomach contain much water; whether the blood in the great vessels be fluid. When water with particles of vegetable matter or mud is found within the body, these must be compared with what may exist in the water in which the body was discovered and should be preserved for further scientific investigation, if requisite. Marks of injuries must be compared diligently with objects both in the water and on the banks near it, and especial attention given to the question whether any observed injuries had been sustained by the body before or after death.

(55.) In cases of suspected death by hanging, strangling, or smothering, it is important to attend particularly to the state of the face as to lividity, compared with the rest of the body; the state of the conjunctiva of the eyes as to vascularity; of the tongue as to position; of the throat, chin, and lips, as to marks of nail-scratches, ruffling of the scarf-skin, or small contusions; the state of the blood as to color and fluidity; the state of the heart as regards the amount of blood in its several cavities; the state of the trunk and branches of the vena cava in the abdomen as regards distention with blood; and the

state of the lungs as regards congestion, rupture of any of the air-cells, and small ecchymoses under the pleura or the pericardium. The mark of a cord or other ligature round the neck must be attentively examined; and here it requires to be mentioned that the mark is often not distinct till seven or eight hours after death, and that it is seldom a dark, livid mark, as is very commonly supposed, but a pale, greenish-brown streak, presenting no ecchymosis, but the thinnest possible line of bright redness at either edge where it is conterminous with the sound skin. Nevertheless, effusions of blood and lacerations should be looked for under and around the mark, in the skin, cellular tissue, muscles, cartilages, and lining membrane of the larynx and trachea. Accessory injuries on other parts of the body, more especially on the chest, back, and arms, must also be looked for, as likewise the appearance of blood having flowed from the nostrils or ears, and the discharge of fæces, urine, or semen. In cases where death may be due to the emanations from burning fuel or other poisonous vapors, a small vial should be filled with the fresh blood and securely corked, for further investigation, if requisite.

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IX. Examination in Cases of Criminal Abortion.

(57.) In suspected criminal abortion, when the woman survives, the chief points for inquiry are: the proofs of recent delivery, the ascertaining of facts tending to show that she has been subjected to manœuvres with instruments, and the occurrence of symptoms traceable to the action of any of the drugs reputed as capable of causing abortion.

When the woman has died, the points requiring special attention at the dissection are: the state of the womb as regards its size, and the condition of its lining membrane in reference to the probable period of delivery; the condition of the intestinal canal in reference to the action of irritant drugs; of the mucous membrane of the bladder in reference to the action of cantharides; close inspection of the womb and vagina in reference to mechanical injuries, especially punctured wounds; and any appearances that the death may have been caused by inflammation in the organs of the pelvis, or by bleeding from the womb.

X. Examination in Cases of Infanticide.

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(59.) The inquiry in cases of infanticide should be conducted with reference to the five following distinct questions: 1. The probable degree of maturity of the child. 2. How long it has been dead. 3. Whether it died before, during, or after delivery, and how long after. 4. Whether death arose from natural causes, neglect, or violence. And, 5. Whether a suspected female be the mother of the child.

(60.) The points to be attended to for ascertaining the probable degree of maturity of the child are: the general appearance and development; the state of the skin, its secretions, and its appendages, — the hair and nails; the presence or absence of the pupillary membrane; the length and weight of the whole body; whether the navel corresponds or not with the middle of the length of the body; the situation of the meconium in the intestines; the site

of the testicles in the case of males, and in either sex the size of the point of ossification in the lower epiphysis of the thigh-bone. This latter is easily observed by making an incision across the front of the knee into the joint, pushing the end of the thigh-bone through the cut, slicing off the cartilaginous texture carefully until a colored point is observed in the section, and then by successive very fine slices ascertaining the greatest diameter of the bony nucleus. This does not exist previous to the thirty-sixth week of gestation, and in a mature child is about one fourth of an inch in diameter.

. . . . . .

(62.) The circumstances which indicate whether the child died before, during, or after parturition, and how long after it, are: the signs of its having undergone putrefaction within the womb; the marks on the crown, feet, buttocks, shoulders, etc., indicating presumptively the kind of labor, and whether it was likely to have proved fatal to the child; the state of the lungs, heart, and great vessels, showing whether or not it had breathed; the nature of the contents of the stomach and intestines; the presence of foreign matters in the wind-pipe; the state of the umbilical cord, or of the navel itself, if the cord be detached.

(63.) In order to ascertain properly the state of the lungs, heart, and great vessels, with a view to determine whether or not the child has breathed, the inspection should be made in the following order: Attend first to the situation of the lungs, how far they rise along the sides of the heart, to their color and texture, and whether they crepitate or not. Then secure a ligature around the great vessels at the root of the neck, and another around the vena cava above the diaphragm. Cut both sets of vessels beyond the ligatures, and remove the heart and lungs in one mass; this mass must be weighed, and put into water, to ascertain whether the lungs, with the heart attached, sink or swim. In the next place, put a ligature around the pulmonary vessels, close to the lungs, and cut away the heart by an incision between it and the ligatures. Lastly, ascertain the weight of the lungs; whether they sink or swim in water; whether blood issues freely or sparingly when they are cut into; whether any fragments swim in the instances where the entire lungs sink; and, in every instance of buoyancy, whether fragments of them continue to swim after being well squeezed in a cloth.

(64.) The general question to be considered in relation to the cause of death is whether the appearances are such as to be traceable to the act of parturition, or whether they indicate some form of violent death. The directions given in Divisions V., VI., and VII. apply to infants as well as adults, but the following points are specially to be noticed in cases of supposed infanticide: —

In relation to wounds and contusions, the possibility of minute punctured wounds of the brain or other vital organs; in reference to injuries of the head, the effusion of blood under the scalp not in the situation where it could have been produced during labor, or fracture of the bones not producible by compression of the head during labor, and not connected with defective ossification of the skull; in reference to the allegation that the head was injured by the child suddenly dropping from the mother when not recumbent, the presence of

sand or other foreign matters on the contused scalp, and the existence of more than one injury of the head; in relation to suffocation, the external and internal signs of this form of death, marks of compressions of the mouth and nose or throat, and the presence of foreign matters in the mouth and throat, air-passages, gullet, or stomach, especially if the body be found in contact with similar substances; in reference to bleeding from the navel-string, a bloodless state of the body, without any wound to account for it; in reference to poisons, most commonly narcotics, the absence of any of the above appearances, with an otherwise healthy state of the body; in reference to starvation and exposure, emaciation of the body, absence of food from the stomach, and an empty, contracted condition of the intestines. In reference to the possibility of the child having been suddenly expelled, and having fallen on the floor, or into privies, etc., the state of the navel-string is to be noted, whether long or short, whether remaining attached to the child and connected with the after-birth, indicating rapid labor, or, if divided, whether it had been cut or torn across.

(65.) The circumstances noticed in §§ 60, 62, 63, and 64, compared with the signs of recent delivery in the female, will lead to the decision of the question whether the suspected female be the mother of the child. The circumstances may be shortly recapitulated as being the signs of the degree of maturity of the child; the signs on the body of the kind of labor; the signs which indicate the date of its death, and the interval which elapsed both between its birth and death, and between its death and the inspection.

R. Christison.
James Syme.
Douglas Maclagan.

B. LETTER OF THE ATTORNEY-GENERAL CONCERNING THE FEES OF WITNESSES AT AUTOPSIES.[1]

[Copy.]

Commonwealth of Massachusetts, Attorney-General's Office.
Boston, *January* 24, 1879.

Dear Sir, — The Statute of 1877, Chapter 200, Section 8, has made no provision for the allowances of fees to the persons who are therein spoken of as witnesses. They are, in the matter contemplated by that section, not witnesses in attendance to testify, but witnesses of what occurs, with an ulterior expectation that they may be called to testify subsequently. They are present to preserve testimony for future use in a matter of the highest importance.

No compensation being fixed by law, they ought to be allowed such fees as, under the circumstances, are just. They may be, and in some cases ought to be, medical men, capable of sustaining the medical examiner in his view of the cause of death where it may require learning and experience. To ask a medical man to attend on such an occasion for the paltry fee of fifty cents is not only manifestly unjust, but unbecoming the dignity of such an inquiry. In my experience as district attorney, I have known five dollars to be allowed to a physician, and less to an unprofessional man.

[1] This letter was written in answer to a note of inquiry on the subject by Medical Examiner Paine, of Brockton, and is published here by permission of the writer.

In my opinion, such fees should be allowed as the circumstances and gravity of the case may make fit and proper. Of this the proper authorities should fairly judge in cases as they arise. Yours truly,

(Signed) GEO. MARSTON.

C. EXTRACTS FROM THE SOCIETY'S RECORDS, 1878–79.

Voted, That all communications read before this society shall become, thereupon, the property of the society, and shall pass at once to the Committee on Publications, unless otherwise disposed of by special vote. June 11, 1878.

Voted, That the code of regulations issued by the Scotch Crown Office to the procurators-fiscal of Scotland for use in connection with criminal and other investigations be referred to the Committee on Publications with regard to the propriety of reprinting such portions as may be useful to Massachusetts medical examiners. February 5, 1879.

Voted, That the corresponding secretary be authorized to have the manuscript returns and reports of views and autopsies bound, and to place the same for safe-keeping in the hands of the librarian of the Boston Medical Library, as a loan. June 10, 1879.

By-law I. was amended by a vote passed at the meeting held October 2, 1878, so that it will read as follows: —

"All elections to membership shall be by ballot expressed in *Yes* or *No*, and nine negative votes shall exclude a candidate from membership for one year; but the due election of all members shall require two-thirds of the affirmative ballots of those members who are present and voting at any stated meeting."

Voted, That the printed Transactions of the current year be distributed by the treasurer as follows: —

To each member who has paid all his assessments to date, three copies.

To each contributor to the Transactions, ten copies.

To each associate member, one copy.

To each of twenty-five periodicals, one copy.

The balance of the edition shall be held for sale to members of the society at cost price (fifteen cents); to others at the best rates which the treasurer can arrange. June 10, 1879.

Voted, That the corresponding secretary ask leave of the attorney-general to send a copy of his letter, concerning the fees of witnesses at an autopsy, to each board of county commissioners in Massachusetts.[1] February 5, 1879.

Voted, That the regular assessment for the current year be two dollars. February 5, 1879.

Voted, That a special assessment of one dollar be levied in addition to the regular assessment, to provide a place of meeting for the society. June 10, 1879.

[1] Permission having been granted by the writer, copies of the letter were distributed according to this vote.

MEMBERS OF THE SOCIETY.

JUNE, 1879.

REGULAR MEMBERS.

S. W. ABBOTT, Wakefield (Corresponding Secretary).
J. F. A. ADAMS, Pittsfield.
ROBERT AMORY, Brookline (Recording Secretary and Treasurer).
C. A. BEMIS, Medway
T. F. BRECK, Springfield (Vice-President).
J. B. BREWSTER, Plymouth.
J. R. BRONSON, Attleborough.
C. A. CARLTON, Salem.
N. S. CHAMBERLAIN, Marlborough.
R. R. CLARKE, Whitinsville.
E. C. COY, Montague.
F. W. DRAPER, Boston (Secretary of Censors).
JEROME DWELLY, Fall River.
D. B. N. FISH, Amherst.
J. C. GLEASON, Rockland.
CHARLES HADDOCK, Beverly.
F. A. HARRIS, Boston.
B. H. HARTWELL, Ayer.
J. G. S. HITCHCOCK, Foxborough.
D. W. HODGKINS, Brookfield.
C. C. HOLCOMBE, Lee.
A. R. HOLMES, Canton.
A. F. HOLT, Cambridge.
ALFRED HOSMER, Watertown (President).
Y. G. HURD, Ipswich.
J. C. IRISH, Lowell.
H. A. JEWETT, Northborough.
HENRY JOHNSON, New Bedford.
J. B. KING, Nantucket.
A. D. KINGSBURY, Needham.
W. D. LAMB, Lawrence.
WILLIAM LEACH, Vineyard Haven.
E. P. MILLER, Fitchburg.
D. W. MINER, Ware.
JAMES MORISON, Quincy.
G. S. OSBORNE, Peabody.
A. E. PAINE, Brockton.
W. M. PARKER, Milford.
JOHN PIERCE, Edgartown.
J. G. PINKHAM, Lynn.
S. D. PRESBREY, Taunton (Chairman of Censors).
J. M. RICE, Worcester.
R. B. ROOT, Georgetown.
IRA RUSSELL, Winchendon.
H. L. SABIN, Williamstown.
G. W. SNOW, Newburyport.
G. B. STEVENS, Gloucester.
J. L. SULLIVAN, Malden.
C. C. TOWER, Weymouth.
J. H. WATERMAN, Westfield.
J. W. WINSLOW, Easthampton.
F. WINSOR, Winchester.

ASSOCIATE MEMBERS (*ex officiis*).

HON. GEORGE MARSTON, Attorney-General.
District Attorney GEORGE STEVENS, Lowell.
District Attorney ASA FRENCH, Braintree.
District Attorney D. W. BOND, Northampton.
District Attorney E. J. SHERMAN, Lawrence.
District Attorney H. B. STAPLES, Worcester.
District Attorney OLIVER STEVENS, Boston.
District Attorney H. M. KNOWLTON, New Bedford.
District Attorney N. A. LEONARD, Springfield.

ASSOCIATE MEMBERS (*by election*).

THEODORE H. TYNDALE, Esq., Boston.
JOHN C. GRAY, Esq., Boston.
W. W. WELLINGTON, M. D., Cambridgeport.
Professor R. H. FITZ, M. D., Boston.
Professor E. S. WOOD, M. D., Cambridge.
A. H. JOHNSON, M. D., Salem.
W. B. HILLS, M. D., Cambridge.
Professor H. P. BOWDITCH, M. D., Boston.
THOMAS DWIGHT, M. D., Boston.
G. K. SABINE, M. D., Brookline.
E. G. CUTLER, M. D., Boston.
WILLIAM COGSWELL, M. D., Bradford.
A. E. PILLSBURY, Esq., Boston.

APPENDIX.

D. DECISION OF POSTMASTER-GENERAL.

In order to determine the application of the postal laws to the reports and forms of this Society, the Corresponding Secretary sent, through the local post-office at Wakefield, a properly filled return of the Society to the Postmaster-General's office, with a request that a reply should be given as to the amount of postage required upon it by the present law. The following reply was returned: —

[Copy.]

Post-Office Department.

Washington, D. C., *February* 13, 1880.

Respectfully returned to the Postmaster at Wakefield with the information that there being no writing on the enclosed blank which is not "*the appropriate filling thereof*," no objection appears to its being sent in the mails in *unsealed envelopes* as Third Class Matter.

(Signed) James H. Marr,
For First Assistant Postmaster General.

E. EXTRACTS FROM THE SOCIETY'S RECORDS, 1879–80.

Voted, That the annual assessment for the ensuing year be three dollars and be due June 1, 1880. February 4, 1880.

Voted, That By-law IV. be amended . . . . so that it shall read: The order of business at each meeting, stated or special, shall be such as the Executive Board, acting as a committee of arrangements, shall prepare. June 8, 1880.

Voted, That the committee appointed at the last stated meeting of the society, to consider the expediency of inducing legislation to regulate the question of expert testimony in the practice of the courts of this commonwealth be continued, and the committee requested to sit again, and to report an organized plan to accomplish necessary legislation. June 8, 1880.

Voted, That a committee, consisting of the president, two regular and two associate members, be constituted to consider the expediency, and, if expedient, to report a plan by which barristers of the commonwealth may be induced to take an active interest in the cultivation of forensic medicine, either by the establishment of a new class of active membership, or by such other means as may seem to that committee best calculated to promote the objects of this vote.

That the same committee also consider the expediency of establishing a permanent council or commission similar to that existing in the Paris Society of Medical Jurisprudence and in the New York Medico-Legal Society. June 8, 1880.

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JUNE, 1880.

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H. A. JEWETT, Northborough.
J. B. KING, Nantucket.
A. D. KINGSBURY, Needham.
W. D. LAMB, Lawrence.
[redacted].
E. P. MILLER, Fitchburg.
D. W. MINER, Ware.
JAMES MORISON, Quincy.
GEORGE N. MUNSELL, Harwich.
G. S. OSBORNE, Peabody.
A. E. PAINE, Brockton.
W. M. PARKER, Milford.
JOHN PIERCE, Edgartown.
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F. WINSOR, Winchester.

ASSOCIATE MEMBERS (*ex officiis*).

W. B. Stoneham

HON. GEORGE MARSTON, Attorney-General.
District Attorney [redacted] STEVENS, [redacted].
District Attorney ASA FRENCH, Braintree.
District Attorney D. W. BOND, Northampton.
District Attorney E. J. SHERMAN, Lawrence.
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Professor E. S. Wood, M. D., Cambridge.
A. H. Johnson, M. D., Salem.
W. B. Hills, M. D., Cambridge.
Professor H. P. Bowditch, M. D., Boston.
Thomas Dwight, M. D., Boston.
G. K. Sabine, M. D., Brookline.
E. G. Cutler, M. D., Boston.
A. E. Pillsbury, Esq., Boston.
C. A. Walker, M. D., Boston.
C. F. Folsom, M. D., Boston.
H. W. Chaplin, Esq., Boston.
B. F. Davenport, M. D., Boston.
Clark Bell, Esq., New York, N. Y.
Professor C. A. Doremus, M. D., Ph. D., New York, N. Y.
Max F. Eller, Esq., New York, N. Y.

APPENDIX.

F. ON THE COLLECTION OF DATA AT AUTOPSIES.[1]

THE committee appointed to consider a plan for securing uniformity in the data of autopsies respectfully present the following blank form to be filled by the examiner making the autopsy, together with detailed instructions for making the required measurements.

As the object of collecting data of this sort is to determine the normal standard of size for the various organs at different ages, as well as the variations from this standard which are associated with different diseases or tendencies to disease, it is important to neglect no opportunity of securing a complete set of measurements, whatever may be the age, sex, or manner of death of the individual.

As an example of the kind of problems to be solved by investigations of this sort, attention is called to the results of Professor Beneke's observations, to which allusion has already been made in volume i., page 140, of the Transactions of this Society. These conclusions are here reproduced in a corrected and modified form in accordance with the request of Professor Beneke, expressed in a letter to one of the committee.

(1.) Before the period of puberty the aorta is *smaller* than the pulmonary artery, after this period the relation begins to be reversed, and in advanced life the aorta is always *larger* than the pulmonary artery.

(2.) The aorta and pulmonary artery are absolutely smaller in the female than in the male, but relatively to the length of the body there is scarcely any difference between the circumference of the arteries in the two sexes, while the heart in females is absolutely, as well as relatively, a little smaller than in males.

(3.) In adult males the volume of the lungs is greater than that of the liver; in adult females the reverse seems to be true.

(4.) In men the volume of the two kidneys is nearly equal to that of the heart; in children it is greater.

(5.) Children have a relatively larger intestinal canal than adults.

(6.) A sudden increase in the size of the heart occurs at the period of puberty.

(7.) The iliac arteries diminish in size during the first three months of life.

(8.) The cancerous diathesis is, in the majority of cases, associated with a

[1] A report presented to the Society, February 1, 1882.

large and powerful heart and capacious arteries, but a relatively small pulmonary artery, small lungs, well-developed bones and muscles, and tolerably abundant adipose tissue.

(9.) Pulmonary tuberculosis is often associated with an unusually small heart.

(10.) In constitutional rachitis the heart is generally large and well developed; the arteries are also large.

The data to be collected by this Society will be of great use in confirming or correcting these and similar conclusions.

H. P. Bowditch.
F. A. Harris.

RECORD OF AUTOPSY.

(1.) Age ....years....months. (2.) Sex .....
(3.) Cause of death .....
(4.) Height of body .....cm. (5.) Weight of body ..... kilo.
(6.) Heart, weight .....grammes; volume .....cc.
(7.) Lungs, weight .....grammes; volume .....cc.
(8.) Liver, weight .....grammes; volume .....cc.
(9.) Spleen, weight .....grammes; volume .....cc.
(10.) Kidneys, weight .....grammes; volume .....cc.
(11.) Testicles, weight .....grammes; volume .....cc.
(12.) Uterus, weight .....grammes; volume .....cc.
(13.) Ovaries, weight .....grammes; volume .....cc.
(14.) Brain, weight .....grammes; volume .....cc.
(15.) Stomach, weight .....grammes.
(16.) Small intestine, length.....cm.
(17.) Large intestine, length.....cm
(18.) Circumference of ascending aorta .... mm.
(19.) Circumference of pulmonary artery .... mm.
(20.) Circumference of thoracic aorta. .... mm.
(21.) Circumference of abdominal aorta .... mm.
(22.) Time between death and autopsy .... hours.
(23.) Rigor mortis .....

A description of the organs, if in any way abnormal, should be given on the opposite side of this sheet, the paragraphs of the description being numbered to correspond to the record.

Signature of Examiner .....

INSTRUCTIONS FOR MAKING MEASUREMENTS.

The measurements required in this record call for special explanation only so far as they relate to the determination of the volume of organs and the circumference of arteries.

The volume of an organ is most simply determined by immersing it in a vessel previously filled to the brim with water, and measuring the amount of water which is thus caused to flow over the edge. The sort of vessel most convenient for this purpose will vary with the size of the organ under investigation. For large organs like the liver a large stone jar or a water pail set in a large basin or tin pan will be found convenient. For smaller organs, such as the testicles, a cup and saucer may be used. It is desirable to use a vessel which has one point of its brim lower than the rest, so that the overflow may always take place from that point. If such a vessel cannot be conveniently procured, the same result may be accomplished by placing the vessel in a slightly inclined position. Vessels made for the purpose may be obtained from C. Gerhardt, in Bonn. The volume of the water displaced by the organ can be measured by pouring it from the vessel into which it overflows nto a graduated cylinder. Such cylinders, from ten to one thousand cubic centimetres' capacity, may be obtained from the Metric Bureau, at prices varying from fifty cents to three dollars.

In the case of organs which float in water (for example, the lungs) a weight

must be attached to effect their complete immersion, and the proper allowance made for the volume of the weight.

The circumference of arteries is measured by opening them along one side, spreading them out flat, and applying a millimetre scale to their inner surface.

The following precautions are to be observed in taking the measurements and in making up the record of the autopsy. The numbers correspond to those of the record.

(1.) The age should be recorded in years and months in the case of children less than two years old. For older children and for adults it is sufficient to record the age at the last birthday. When the age is estimated, and not accurately known, the fact should be stated in the record.

(4.) The height of the body is best measured by placing boxes or other square-cornered objects against the head and feet of the body as it rests horizontally upon the floor or table, marking the position of the boxes upon the surface on which they rest, and measuring the distance between the marks thus obtained.

(5.) The weight of the body of an adult may be readily determined on small grocer's scales by placing it upon a board laid across the platform. The weight of the board must of course be deducted.

(6.) The heart is prepared for measurement by opening all its cavities and removing the clots, by cutting off the aorta and pulmonary artery on a line with the upper border of the semilunar valves, by cutting off the veins at their junction with the auricles, and by removing adherent portions of pericardium. In measuring the volume of the heart by immersing it in water care should be taken to prevent air bubbles from being entangled by the valves and trabeculæ. If an unusual amount of fat is adherent to the muscular substance of the heart the fact should be stated in the record.

(7.) The lungs are prepared by removing the bronchial glands and adherent portions of pleural membrane, and by cutting off the blood-vessels and bronchial tubes as near as possible to the hilus. A weight of 0.5 to 1 kilogramme to insure the immersion of the lungs may be best attached by means of a large, sharp hook, on which the lungs can be impaled. It is particularly important in the case of the lungs to give a full account of any pathological changes that may be noticed, such as œdema, engorgement, etc.; otherwise the determination of the volume and weight has little value.

(8.) The liver is prepared by removing adherent portions of the diaphragm and vena cava, as well as the ligaments and the gall bladder. The vessels are to be cut off close to the hilus.

(9.) The spleen is prepared by removing from the hilus the fat, connective tissue, and blood-vessels.

(10.) The kidneys are prepared by removing the capsules, and freeing the hilus as far as possible from fat, connective tissue, and vessels.

(11.) The testicles are prepared by cutting off the cord on a level with the head of the epididymis.

(12.) The uterus is prepared by cutting off the ligaments as close as possible to the body of the organ, and removing adherent portions of the vaginal walls.

(13.) The ovaries are prepared by removing adherent portions of the peritonæum.

(14.) The brain is to be removed in the usual manner, the medulla being divided at the point of the calamus scriptorius.

(15.) The stomach is prepared by separating from the œsophagus and the intestines at the cardiac and pyloric orifices respectively, and by removing adherent portions of peritonæum and fat. The organ is to be opened along its lesser curvature, and the contents entirely removed.

(16.) The length of the small intestine is measured from the pylorus to the ileo-cæcal valve. The organ is prepared by removing the mesentery as completely as possible, and forcing a stream of water through it to remove the intestinal contents. It is then to be spread out upon a table, and its length determined. In consequence of the elasticity of the intestine an error of two per cent. is hardly to be avoided.

(17.) The length of the large intestine is measured from the origin of the appendix vermiformis to the anus. The organ is prepared in the same way as the small intestine.

The circumference of the arteries to be determined, as above described, is measured at the following points: —

(18.) Ascending aorta, one centimetre above the border of the semilunar valves.

(19.) Pulmonary artery, same as ascending aorta.

(20.) Thoracic aorta, at a point one third of the distance from the origin of the left subclavian artery to the bifurcation of the abdominal aorta.

(21.) Abdominal aorta, two centimetres above its bifurcation.

(23.) State, if possible, the duration and intensity of the rigor mortis, and whether it had entirely disappeared at the time of the autopsy.

G. REPORT ON THE DEFINITION OF "VIOLENCE."

The committee appointed to consider and report on the proper definition of the word "violence," as used in the Medical Examiner Law, reports as follows: —

The word violence occurs in several sections of the law. A strict definition of the word which should apply to all sections would compel a course of action on the part of the medical examiner and other authorities not contemplated by the statute; that is, it would compel a judicial hearing by officers of the courts in every case of death which was the result of causes other than natural, no matter how clear might be the fact that the death was one of misadventure purely. In Sections 7 and 8 the word violence seems to be used in the sense above indicated; that is, it seems to be the intention of the statute that the medical examiner shall investigate all cases where the death is supposed to be the result of causes other than natural. Now if this interpretation should be applied to Section 9, much unnecessary labor and expense would be entailed.

In order to get at the true meaning of the word here, we should take the law as a whole, and also interpret it by the light of the law for which it is substituted. If we do this and regard the provisions of Section 10 concerning

railroad accidents, and those of Section 15 as to the powers of the District Attorney and Attorney-General, it seems clear that the word violence in Section 9 means that violence which may have proceeded from a person other than the deceased; in other words, the intent of the statute was to leave discretionary powers with the medical examiner in certain cases, such as accident, suicide, etc.

On the other hand, the settling of such questions imposes upon the medical examiner the responsibility of deciding matters involving both law and fact, and thus fails in securing that divorce between law and medicine contemplated by the framers of the statute, and compels a course of action which a medical man ought not to be expected to undertake. The statute already provides for the course of action when the medical examiner is satisfied that the death may have resulted from the act of another person than the deceased; it should further provide that in all other cases where the death is the result of causes other than natural, that "the medical examiner shall forthwith and prior to an autopsy file with the District Attorney for the county where the death occurs a report setting forth all the facts and circumstances tending to show the cause and manner of death, and the determination of the question whether an inquest shall be held or not shall in such cases rest with the District Attorney."

Your committee recommends that such amendment be asked for.

FRANCIS A. HARRIS, *Chairman.*

APPENDIX.

H. TWO RECENT MEDICO-LEGAL DECISIONS OF THE SUPREME COURT OF MASSACHUSETTS.[1]

[THE circumstances of the case which was the occasion of these decisions were, in brief, as follows:[2] A young unmarried woman died suddenly in the office of Henry Taylor, an irregular physician, in the afternoon of October 26, 1881. To the medical examiner, on his arrival soon afterward, Taylor stated that his patient had fallen over in a fainting fit while she was sitting by his side answering his questions, her sister being in an adjoining room; that she died in a few minutes, in spite of the combined and vigorous efforts of himself and a neighboring doctor whom he called to his help; that the cause of her death, as he believed, was heart disease, to which she had long been subject. An undertaker was summoned to remove the body of the girl to her home; but before the removal was accomplished, the medical examiner had asked and secured permission from the family to make an autopsy, upon the ground that it was important to verify the cause of the death; the question of violence had not then been raised. Under this free permission, presumed to be a sufficient authority for a private autopsy, the medical examiner proceeded early the following morning to make his inspection of the body. The very first steps in the examination indicated clearly that the whole truth had not been told on the previous day, and that probably the death was not due to natural causes. Accordingly, in order to conform as far as was then practicable with the law concerning the investigation of deaths by violence, two witnesses (one of them a physician) were summoned to attend during the rest of the examination. The authority to which the statute refers as being requisite before an autopsy is begun was not obtained, but when the report of the investigation was filed with the District Attorney he readily gave his written assent to all the proceedings. The post-mortem section discovered that the woman was pregnant, the womb containing a fœtus measuring fourteen inches and weighing two pounds; that all the organs in the body were of healthy structure; and that the cause of the death was the admission of a large amount of air to the heart through uterine sinuses forcibly and recently ruptured by some blunt instrument like a catheter or a sound, — in other words, that the case was one commonly known as "criminal abortion."

[1] Massachusetts Reports, vol. cxxxii., p. 261, 1882.

[2] Reported, as an oral communication, at the meeting of February 7, 1883, by F. W. Draper, Medical Examiner.

As a consequence of these revelations, the doctor in whose presence the patient had died was arrested, indicted, tried, and convicted upon a charge of attempting to procure the miscarriage of the woman, and of thereby causing her death.

At the beginning of the trial in the Superior Court, before any testimony was presented, the counsel for the defendant moved to quash the indictment for the reason that it contained no allegation that the deceased was pregnant when the accused attempted to procure her miscarriage as charged. This motion was overruled, and the trial proceeded.

At a later stage objection was made, in behalf of the prisoner, to the admission of any testimony from the medical examiner relating to the autopsy upon the body, because he (the examiner) had failed to comply with the provisions of the law, in that "he had no authority from the district attorney, mayor, or selectmen of the district, city, or town, where such body lay, to make such autopsy; that his autopsy was not made in the presence of two or more discreet persons; and that he did not call the attention of any witness to the position and appearance of the body before making such autopsy." The objection was overruled, and the testimony was admitted in full, the medical examiner being permitted to testify as a medical expert.

The accused having been found guilty by the jury, the case was carried, in his behalf, to the Supreme Judicial Court, upon a motion to set aside the verdict because of the imputed error in the indictment as above mentioned, and also upon a bill of exceptions setting forth the irregular proceedings of the medical examiner in connection with the autopsy and objecting to the ruling which admitted his testimony. The following is a copy of the rescript, as prepared by Hon. Charles Allen, one of the Justices of the Supreme Court, and assented to by the full bench.]

Commonwealth *vs.* Henry Taylor.

It is not necessary to the maintenance of an indictment under the General Statutes, chap. 165, § 9, for an attempt to procure the miscarriage of a woman, that she should be pregnant with child.

The testimony of a medical examiner, who is conceded to be qualified as a medical expert, as to what he found upon making an autopsy is not rendered incompetent by the fact that, in making the autopsy, he proceeded without authority, and did not in other respects follow the course prescribed by the Statutes of 1877, chap. 200, for medical examiners in such cases.

C. Allen, J. The principal question in this case is whether, under the Gen. St. c. 165, § 9, it is a criminal offense to do the acts therein mentioned with intent to procure the miscarriage of a woman who is not in fact pregnant with child. The question arises upon a motion to quash the indictment, which contains no averment of such pregnancy; but it has been argued, and we have considered it, as if it had appeared in evidence on the trial that she was not so pregnant. A brief examination of the Statutes on this subject, in England and in this Commonwealth, leaves no doubt in our minds as to the true construction. Under the St. of 43 Geo. III. c. 58, § 2, it had been held that, in order to constitute this offense, it was necessary that the woman should be with child. Thereupon the St. of 9 Geo. IV. c. 31, § 13, was passed, which

provided in terms for the punishment of acts done with intent to procure the miscarriage of any woman not being, or not being proved to be, then quick with child. This was followed by the St. of 7 Will. IV. and 1 Vict. c. 85, which makes punishable similar acts, with intent to procure the miscarriage of any woman, not mentioning whether she must be with child or not. Under this statute it was held in Regina *v.* Goodchild, 2 Car. & K. 293, that a conviction was right, although it appeared on an examination of the woman's body after death that she was not pregnant at the time she was operated on. Under this state of things the Gen. St. c. 165, § 9, were passed, adopting substantially the same language as the English statute; and, if there were nothing more to aid in ascertaining the intention of the Legislature, the presumption would be strong that it was intended to adopt the same construction which had been given to the statute in England.

But this view of the meaning of the statute is made conclusive by a recurrence to the former legislation in Massachusetts. By the statute of 1845, c. 27, the doing of these acts with the intent to cause and procure the miscarriage of a woman "then pregnant with child" was made punishable. This statute continued in force until the adoption of the General Statutes. The commissioners in their revision preserved the words above quoted, which made it necessary to prove such pregnancy; but the Legislature omitted them. These words were not superfluous, but were of vital significance. It has been asserted, with great vigor of expression, that when a statute is revised, or one act framed from another, some parts being omitted, the parts omitted are not to be revived by construction, but are to be considered as annulled; and that to hold otherwise would be to impute to the Legislature gross carelessness or ignorance, which is altogether inadmissible. In view of this rule, declared sixty years ago to be well settled, the statute in question was passed, and must be deemed to have been intended to change the law.

The defendant objected at the trial that the medical examiner, who made an autopsy of the body of the deceased, and who was conceded to be qualified as a medical expert, could not be allowed to testify to what he found upon such autopsy, for the reason that, in making it, he proceeded without authority, and did not in other respects follow the course prescribed by the Statutes of 1877, c. 200, for medical examiners in such cases; but we are of opinion that such want of authority or irregularity on his part did not render his testimony incompetent. *Exceptions overruled.*

G. R. Swasey, for the defendant.

G. Marston, Attorney General, and *C. H. Barrows*, Assistant Attorney General, for the Commonwealth.

I. EXTRACTS FROM THE SOCIETY'S RECORDS, 1883.

Voted, That the Corresponding Secretary be instructed to request members of the Society to report cases of special interest for publication. June 12, 1883.

Voted, That the Treasurer be instructed to expend, annually, before the first day of January, until further orders, from unappropriated funds in his hands,

a sum not exceeding twenty dollars for journals, or books, or both, devoted to legal medicine, — to be circulated among such of the regular members of the Society as have paid all their assessment-dues to the date on which the book or journal leaves the office of the Treasurer; the books and journals, after their circulation, being finally deposited, as the property of the Society, with the Boston Medical Library Association. October 3, 1883.

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Prof. Thomas Dwight, M.D., Boston.

Max F. Eller, Esq., New York, N. Y.
Prof. R. H. Fitz, M.D., Boston.
J. C. Gray, Esq., Boston.
Prof. W. B. Hills, M.D., Cambridge.
A. H. Johnson, M.D., Salem.
Arthur Kemble, M.D., Salem.
Theodore M. Osborne, Esq., Peabody.
A. E. Pillsbury, Esq., Boston.
J. L. Stackpole, Esq., Boston.
T. H. Tyndale, Esq., Boston.
W. W. Wellington, M.D., Cambridge.
Prof. E. S. Wood, M.D., Cambridge.

OFFICERS OF THE SOCIETY, 1877–1885.

PRESIDENTS.

Alfred Hosmer, M.D.,	1877–1879.
Robert Amory, M.D.,	1879–1881.
Silas D. Presbrey, M.D.,	1882–1885.
Frederick Winsor, M.D.,	1885–

VICE-PRESIDENTS.

Theodore F. Breck, M.D.,	1877–1879.
Silas D. Presbrey, M.D.,	1879–1881.
Frederick Winsor, M.D.,	1881–1885
Joseph G. Pinkham, M.D.,	1885–

CORRESPONDING SECRETARIES.

Frederick Winsor, M.D.,	1877–1879.
Samuel W. Abbott, M.D.,	1879–1882.
Joseph G. Pinkham, M.D.,	1882–1885.
Benjamin H. Hartwell, M.D.,	1885–

RECORDING SECRETARIES.

Robert Amory, M.D.,	1877–1879.
Charles C. Tower, M.D.,	1879–1882.
William H. Taylor, M.D.,	1882–

TREASURERS.

Robert Amory, M.D.,	1877–1879.
Charles C. Tower, M.D.,	1879–

APPENDIX.

MASSACHUSETTS LAWS RELATING TO MEDICAL EXAMINERS.

Compiled from Statutes in Force October 1, 1886.

Section 1. The governor shall nominate, and by and with the consent of the council shall appoint, in each county able and discreet men, learned in the science of medicine, to be medical examiners in such county, and every such nomination shall be made at least seven days prior to the appointment.

Nomination and appointment. P. S. 26, § 1. 1877, 200, §§ 2, 6.

Section 2. The number of medical examiners, appointed as provided in the preceding section, shall be as follows : —

Number and location. P. S. 26, § 2. 1877, 200, §§ 2, 6.

For the county of Barnstable, three examiners, being one in each of the three districts into which said county is divided for said purpose, namely : —

Barnstable.

District 1, composed of the towns of Harwich, Dennis, Yarmouth, Brewster, Chatham, Orleans, and Eastham (Medical Examiner George N. Munsell, of Harwich).

District 2, composed of the towns of Barnstable, Bourne, Sandwich, Mashpee, and Falmouth (Medical Examiner F. W. Pierce, of Marston's Mills).

District 3, composed of the towns of Provincetown, Truro, and Wellfleet (Medical Examiner Frank L. Newton, of Provincetown).

For the county of Berkshire, four examiners, being one in each of the four districts into which said county is divided for said purpose, namely : —

Berkshire.

District 1, composed of the towns of Williamstown, Clarksburg, Adams, North Adams, Florida, Savoy, New Ashford and Cheshire (Medical Examiner O. J. Brown, of North Adams).

District 2, composed of the towns of Lanesborough, Windsor, Pittsfield, Dalton, Hinsdale, Peru, and Hancock (Medical Examiner F. K. Paddock, of Pittsfield).

District 3, composed of the towns of Richmond, Lenox, Washington, Becket, Lee, Stockbridge, Tyringham, and Otis (Medical Examiner C. C. Holcombe, of Lee).

District 4, composed of the towns of West Stockbridge, Alford, Great Barrington, Monterey, Sandisfield, New Marlborough, Shef-

field, Egremont, and Mount Washington (Medical Examiner S. Camp, of Great Barrington).

Bristol. For the county of Bristol, four examiners, being one in each of the four districts into which said county is divided for said purpose, namely : —

District 1, composed of the towns of Attleborough, Seekonk, Norton, Mansfield, and Rehoboth (Medical Examiner F. L. Burden, of North Attleborough).

District 2, composed of the city of Taunton, and the towns of Raynham, Easton, Berkley, and Dighton (Medical Examiner S. D. Presbrey, of Taunton).

District 3, composed of the city of Fall River, and the towns of Somerset, Swanzey, Freetown, and Westport (Medical Examiner Jerome Dwelly, of Fall River).

District 4, composed of the city of New Bedford, and the towns of Dartmouth, Fairhaven, and Acushnet (Medical Examiner W. H. Taylor, of New Bedford).

Dukes. For the county of Dukes, three examiners, being one in each of the three districts into which said county is divided for said purpose, namely : —

District 1, composed of the towns of Edgartown, and Cottage City (Medical Examiner Thomas J. Walker, of Edgartown).

District 2, composed of the towns of Tisbury and Gosnold (Medical Examiner William Leach, of Tisbury).

District 3, composed of the towns of Chilmark and Gay Head (vacancy).

Essex. For the county of Essex, ten examiners, being one in each of the ten districts into which said county is divided for said purpose, namely : —

District 1, composed of the city of Gloucester and the town of Rockport (Medical Examiner George B. Stevens, of Gloucester.)

District 2, composed of the towns of Ipswich, Rowley, Hamilton, and Essex (Medical Examiner J. G. Hayes, of Ipswich).

District 3, composed of the City of Newburyport and the towns of Newbury, West Newbury, Amesbury, and Salisbury (Medical Examiner George W. Snow, of Newburyport).

District 4, composed of the city of Haverhill and the towns of Bradford, and Merrimac (Medical Examiner William Cogswell, of Bradford).

District 5, composed of the city of Lawrence and the towns of Methuen, Andover, and North Andover (Medical Examiner O. T. Howe, of Lawrence).

District 6, composed of the towns of Georgetown, Boxford, Topsfield, and Groveland (Medical Examiner R. B. Root, of Georgetown).

District 7, composed of the towns of Beverly, Wenham, and Manchester (Medical Examiner Charles Haddock, of Beverly).

District 8, composed of the towns of Peabody, Danvers, Middleton, and Lynnfield (Medical Examiner George S. Osborne, of Peabody).

District 9, composed of the city of Lynn and the towns of Saugus, Nahant, and Swampscott (Medical Examiner, J. G. Pinkham, of Lynn).

District 10, composed of the city of Salem and the town of Marblehead (Medical Examiner C. A. Carlton, of Salem).

For the county of Franklin, three examiners, being one in each of the three districts into which said county is divided for said purpose, namely : — Franklin. P. S. 26. § 2. 1884, 321, § 1.

Eastern district, composed of the towns of Bernardston, Erving, Gill, Greenfield, Leverett, Montague, Northfield, Shutesbury and Sunderland (Medical Examiner E. C. Coy, of Montague).

Western district, composed of the towns of Ashfield, Buckland, Charlemont, Colrain, Conway, Deerfield, Hawley, Heath, Leyden, Monroe, Rowe, Shelburne, and Whately (Medical Examiner F. J. Canedy, of Shelburne Falls).

Northern district, composed of the towns of Orange, Warwick, New Salem, and Wendell (Medical Examiner W. M. Wright, of Orange).

For the county of Hampden, four examiners, being one in each of the four districts into which said county is divided for said purpose, namely : — Hampden.

District 1, composed of the towns of Brimfield, Holland, Palmer, Monson, and Wales (Medical Examiner W. Holbrook, of Palmer).

District 2, composed of the city of Springfield, and the towns of Agawam, Chicopee, Longmeadow, Ludlow, West Springfield, Wilbraham, and Hampden (Medical Examiner T. F. Breck, of Springfield.

District 3, composed of the city of Holyoke (Medical Examiner L. M. Tuttle, of Holyoke).

District 4, composed of the towns of Blandford, Chester, Granville, Montgomery, Russell, Southwick, Tolland, and Westfield (Medical Examiner J. H. Waterman, of Westfield).

For the county of Hampshire, four examiners, being one in each of the four districts into which said county is divided for said purpose, namely : — Hampshire.

District 1, composed of the towns of Chesterfield, Cummington, Goshen, Hatfield, Northampton, Plainfield, and Williamsburgh (Medical Examiner C. Seymour, of Northampton).

District 2, composed of the towns of Easthampton, Huntington,

Middlefield, Southampton, Westhampton, and Worthington (Medical Examiner J. W. Winslow, of Easthampton).

District 3, composed of the towns of Amherst, Granby, Hadley, Pelham, and South Hadley (Medical Examiner D. B. N. Fish, of Amherst).

District 4, composed of the towns of Belchertown, Enfield, Prescott, and Ware (Medical Examiner D. W. Miner, of Ware).

Middlesex. For the county of Middlesex, ten examiners, being one in each of the ten districts into which said county is divided for said purpose, namely: —

District 1, composed of the city of Cambridge, and the towns of Belmont and Arlington (Medical Examiner A. F. Holt, of Cambridge).

District 2, composed of the cities of Malden and Somerville, and the towns of Everett and Medford (Medical Examiner T. M. Durell, of Somerville).

District 3, composed of the towns of Melrose, Stoneham, Wakefield, Wilmington, Reading, and North Reading (Medical Examiner Winthrop F. Stevens, of Stoneham).

District 4, composed of the towns of Woburn, Winchester, Lexington, and Burlington (Medical Examiner Frederick Winsor, of Winchester).

District 5, composed of the city of Lowell, and the towns of Dracut, Tewksbury, Billerica, Chelmsford, and Tyngsborough (Medical Examiner J. C. Irish, of Lowell).

District 6, composed of the towns of Concord, Carlisle, Bedford, Lincoln, Littleton, Acton, and Boxborough (Medical Examiner H. A. Barrett, of Concord).

District 7, composed of the cities of Newton and Waltham, and the towns of Watertown and Weston (Medical Examiner J. A. Mead, of Watertown).

District 8, composed of the towns of Framingham, Wayland, Natick, Sherborn, Holliston, Hopkinton, and Ashland (Medical Examiner Z. B. Adams, of Framingham).

District 9, composed of the towns of Marlborough, Hudson, Maynard, Stow, and Sudbury (Medical Fxaminer E. G. Hoitt, of Marlborough).

District 10, composed of the towns of Ayer, Groton, Westford, Dunstable, Pepperell, Shirley, Townsend, and Ashby (Medical Examiner B. H. Hartwell, of Ayer.

Nantucket. For the county of Nantucket, one examiner (Medical Examiner John A. Kite, of Nantucket).

Norfolk. For the county of Norfolk, nine examiners, being one in each of the nine districts into which said county is divided for said purpose, namely: —

District 1, composed of the towns of Dedham, Needham, Wellesley, Norwood, and Dover (Medical Examiner A. H. Hodgdon, of Dedham).

District 2, composed of the towns of Hyde Park and Milton (Medical Examiner Charles Sturtevant, of Hyde Park).

District 3, composed of the towns of Quincy and Randolph (Medical Examiner J. H. Gilbert, of Quincy).

District 4, composed of the towns of Weymouth, Braintree, and Holbrook (Medical Examiner C. C. Tower, of South Weymouth).

District 5, composed of the towns of Stoughton, Canton, Walpole, and Sharon (Medical Examiner A. R. Holmes, of Canton).

District 6, composed of the towns of Franklin, Foxborough, and Wrentham (Medical Examiner J. G. S. Hitchcock, of Foxborough).

District 7, composed of the towns of Medway, Millis, Medfield, Norfolk, and Bellingham (Medical Examiner C. A. Bemis, of Millis).

District 8, composed of the town of Brookline (Medical Examiner G. K. Sabine, of Brookline).

District 9, composed of the town of Cohasset (Medical Examiner G. P. Pratt, of Cohasset).

Plymouth. P. S. 26, § 2. 1886, 74.

For the county of Plymouth, five examiners, being one in each of the five districts into which said county is divided for said purpose, namely: —

District 1, composed of the city of Brockton and the towns of West Bridgewater, East Bridgewater, Bridgewater, and Whitman (Medical Examiner A. E. Paine, of Brockton).

District 2, composed of the towns of Abington, Rockland, Hanover, Hanson, South Scituate, and Pembroke (Medical Examiner J. C. Gleason, of Rockland).

District 3, composed of the towns of Plymouth, Halifax, Kingston, Plympton, and Duxbury (Medical Examiner J. B. Brewster, of Plymouth).

District 4, composed of the towns of Middleborough, Wareham, Mattapoisett, Carver, Rochester, Lakeville, and Marion (Medical Examiner G. L. Ellis, of Middleborough).

District 5, composed of the towns of Hingham, Hull, Scituate, and Marshfield (Medical Examiner J. Winthrop Spooner, of Hingham).

Suffolk.

For the county of Suffolk, two examiners (Medical Examiners F. W. Draper and F. A. Harris, of Boston).

Worcester.

For the county of Worcester, eleven examiners, being one in each of the eleven districts into which said county is divided for said purpose, namely: —

District 1, composed of the towns of Athol, Petersham, Phillipston, and Royalston (Medical Examiner J. P. Lynde, of Athol).

District 2, composed of the towns of Gardner, Templeton, and Winchendon (Medical Examiner Ira Russell, of Winchendon).

District 3, composed of the city of Fitchburg and the towns of Ashburnham, Leominster, Lunenburg, Princeton, and Westminster (Medical Examiner E. P. Miller, of Fitchburg).

District 4, composed of the towns of Berlin, Bolton, Clinton, Harvard, Lancaster, and Sterling (Medical Examiner G. M. Morse, of Clinton).

District 5, composed of the towns of Grafton, Northborough, Southborough, and Westborough (Medical Examiner H. A. Jewett, of Northborough).

District 6, composed of the towns of Mendon, Milford, Hopedale, and Upton (Medical Examiner J. M. Eaton, of Milford).

District 7, composed of the towns of Blackstone, Douglas, Northbridge, and Uxbridge (Medical Examiner R. R. Clarke, of Uxbridge).

District 8, composed of the towns of Charlton, Dudley, Oxford, Southbridge, Sturbridge, and Webster (Medical Examiner S. C. Hartwell, of Southbridge).

District 9, composed of the towns of Brookfield, North Brookfield, Spencer, Warren, and West Brookfield (Medical Examiner D. W. Hodgkins, of Brookfield).

District 10, composed of the towns of Barre, Dana, Hubbardston, Hardwick, New Braintree, Oakham, and Rutland (Medical Examiner C. W. Whitcomb, of Barre).

District 11, composed of the city of Worcester and the towns of Auburn, Boylston, Holden, Leicester, Millbury, Paxton, Shrewsbury, Sutton, and West Boylston (Medical Examiner J. M. Rice, of Worcester).

P. S. 26, § 3.
1881, 295.

SECTION 3. The governor may also in like manner nominate and appoint an associate medical examiner for the county of Suffolk, who shall, at the request of either of the medical examiners for said county, perform all the duties and exercise all the powers of a medical examiner in said county, but he shall not in any year be required to serve for more than one month at the request of either of said medical examiners. (Associate Medical Examiner George Stedman, of Boston.)

Term of office.
P. S. 26, § 4.
1877, 200, § 4.
1880, 59, § 2.

SECTION 4. Said medical examiners and associate medical examiner shall hold their offices for a term of seven years from the time of their respective appointments, but shall be liable to removal from office by the governor and council at any time for cause shown.

Bonds.
P. S. 26, § 5.
1877, 200, § 5.
1880, 59, § 2.

SECTION 5. Each medical examiner and the associate medical examiner for Suffolk County shall, before entering upon the duties of his office, be sworn and give bond with sureties to the

treasurer of the county in the sum of five thousand dollars, for the faithful performance of such duties. If he fails to give such bond for thirty days after his appointment, such appointment shall be void.

Approval of bonds. P. S. 26, § 6. 1877, 200, § 24.

SECTION 6. The superior court shall each year examine into the sufficiency of all bonds given under the preceding section; and if it appears that any such bond is insufficient, said court shall cause a record of that fact to be made by its clerk, and shall require the party who gave such bond to give a new one, satisfactory to the court within such time as it shall order.

Discharge of sureties. P. S. 26, § 7. 1877, 200, § 24.

SECTION 7. A surety on any such bond, or his heirs, executors, or administrators, may petition the superior court, for the county for which the officer who gave it was appointed, to be discharged from such bond, and like proceedings shall thereupon be had as in case of a similar petition by a surety on a sheriff's official bond.

Breach of condition of bond. P. S. 26, § 8. 1877, 200, § 24.

SECTION 8. If the condition of any such bond is broken to the injury of any person, the officer who gave it shall be liable to removal from his office and be subject to like penalties as sheriffs in like cases, and actions may be brought upon such bonds in like manner as upon the official bonds of sheriffs.

Salaries, fees, mileage. P. S. 26, § 9. 1877, 200, § 3. 1881, 295. 1885, 379, § 1.

SECTION 9. In the county of Suffolk, each medical examiner shall receive from the treasurer of the county, in full for all services performed by him, a salary of three thousand dollars a year, and the associate medical examiner a salary of five hundred dollars; but if the said associate medical examiner serves in any year more than two months at the request of either medical examiner, he shall, for such service in excess of two months, be paid at the same rate as such medical examiner, and such compensation shall be deducted from the salary of the medical examiner in whose stead he serves. The medical examiners in other counties shall receive fees as follows: For a view without an autopsy, five dollars; for a view and autopsy, thirty dollars; and for travel, at the rate of ten cents a mile to and from the place of view.

Duties of examiners. P. S. 26, § 10. 1877, 200, § 7.

SECTION 10. Medical examiners shall make examinations as hereinafter provided, upon the view of the dead bodies of such persons only as are supposed to have come to their death by violence.

View and autopsy. P. S. 26, § 11. 1877, 200, §8. 128 Mass. 422.

SECTION 11. When a medical examiner has notice that there has been found, or is lying within his county, the dead body of a person who is supposed to have come to his death by violence, he shall forthwith repair to the place where such body lies and take charge of the same; and if, on view thereof and personal inquiry into the cause and manner of the death, he deems a further examination necessary, he shall, upon being thereto authorized in writing by the district-attorney, mayor, or selectmen of the district, city, or town where such body lies, make an autopsy in the

presence of two or more discreet persons, whose attendance he may compel by subpœna if necessary, and shall then and there carefully reduce or cause to be reduced to writing every fact and circumstance tending to show the condition of the body and the cause and manner of death, together with the names and addresses of said witnesses, which record he shall subscribe. Before making such autopsy he shall call the attention of said witnesses to the position and appearance of the body.

Reports filed in cases of death by violence. P. S. 26, §12. 1877, 200, § 9.

SECTION 12. If upon such view, personal inquiry, or autopsy, he shall be of opinion that the death was caused by violence, he shall at once notify the district-attorney and a justice of the district, police, or municipal court for the district or city in which the body lies, or a trial justice, and shall file a duly attested copy of the record of his autopsy in such court, or with such justice, and a like copy with such district-attorney; and shall in all cases certify to the clerk or registrar having the custody of the records of births, marriages, and deaths in the city or town in which the person deceased came to his death, the name and residence of the person deceased, if known, or, when the name and residence cannot be ascertained, a description of the person deceased, as full as may be, for identification, together with the cause and manner by and in which he came to his death.

The inquest. P. S. 26, § 13. 1877, 200, § 10.

SECTION 13. The court or trial justice shall thereupon hold an inquest, which may be private, in which case any or all persons other than those required to be present by the provisions of this chapter may be excluded from the place where such inquest is held; and said court or trial justice may also direct the witnesses to be kept separate, so that they cannot converse with each other until they have been examined. The district-attorney, or some person designated by him, may attend the inquest and may examine all witnesses. An inquest shall be held in all cases of death by accident upon a railroad; and the district attorney or the attorney-general may, if he deems it necessary or expedient, direct an inquest to be held in the case of any other casualty from which the death of any person results.

Witnesses at inquest. P. S. 26, § 14. 1877, 200, § 11.

SECTION 14. The justice or district-attorney may issue subpœnas for witnesses, returnable before such court or trial justice. The persons served with such processes shall be allowed the same fees, their attendance may be enforced in the same manner, and they shall be subject to the same penalties, as if served with a subpœna in behalf of the commonwealth in a criminal prosecution pending before such court or trial justice.

Report of inquest. P. S. 26, § 15. 1877, 200, § 12.

SECTION 15. The presiding justice or trial justice shall, after hearing the testimony, draw up and sign a report in which he shall find and certify when, where, and by what means the person

deceased came to his death, his name if known, and all material circumstances attending his death; and if it appears that his death resulted wholly or in part from the unlawful act of any other person or persons, he shall further state, the name or names of such person or persons, if known to him, and he shall file such report with the records of the superior court in the county wherein the inquest is held.

Witnesses bound over. P. S. 26, § 16. 1877, 200, § 13.

SECTION 16. If the justice finds that murder, manslaughter, or an assault has been committed, he may bind over, as in criminal prosecutions, such witnesses as he deems necessary, or as the district-attorney may designate, to appear and testify at the court in which an indictment for such offense may be found or presented.

Arrest of an accused person. P. S. 26, § 17. 1877, 200, § 14.

SECTION 17. If a person charged by the report with the commission of any offense is not in custody, the justice shall forthwith issue process for his apprehension, and such process shall be made returnable before any court or magistrate having jurisdiction in the premises, who shall proceed therein in the manner required by law; but nothing herein shall prevent any justice from issuing such process before the finding of such report, if is otherwise lawful to issue the same.

Inquest may be ordered by district-attorney or attorney general. P. S. 26, § 18. 1877, 200, § 15.

SECTION 18. If a medical examiner reports that a death was not caused by violence, and the district-attorney or the attorney-general is of a contrary opinion, either the district-attorney or the attorney-general may, notwithstanding such report, direct an inquest to be held in accordance with the provisions of this chapter, at which inquest he or some person designated by him shall be present and examine all the witnesses.

Chemist and clerk. P. S. 26. § 19. 1877, 200, § 16.

SECTION 19. The medical examiner may, if he deems it necessary, employ a chemist to aid in the examination of the body or of substances supposed to have caused or contributed to the death, and such chemist shall be entitled to such compensation for his services as the medical examiner certifies to be just and reasonable, the same being audited and allowed in the manner hereinafter provided. A clerk, who may be employed to reduce to writing the results of a medical examination or autopsy shall be allowed for his services two dollars per day. When a medical examiner deems it necessary to have a physician present at an autopsy as one of the witnesses, as provided in section eleven of this chapter, such physician shall be allowed five dollars for his services. Other witnesses required by law to be present at an autopsy shall be allowed two dollars each.

Medical witnesses at autopsy. 1885, 379, § 2.

Other witnesses at autopsy. 1885, 379, § 2.

Burial of strangers. P. S. 26, § 20. 1877, 200, § 17.

SECTION 20. When a medical examiner views or makes an examination of the dead body of a stranger, he shall cause the body to be decently buried; and if he certifies that he has made

careful inquiry, and that to the best of his knowledge and belief the person found dead is a stranger having no settlement in any city or town of this commonwealth, his fees, with the actual expense of burial, shall be paid from the treasury of the commonwealth. In all other cases the expense of the burial shall be paid by the city or town, and all other expenses by the county, wherein the body is found.

Recovery of bodies from water. P. S. 26, § 21. 1877, 200, § 18.

SECTION 21. When services are rendered in bringing to land the dead body of a person found in any of the harbors, rivers, or waters of the commonwealth, the medical examiner may allow such compensation for said services as he deems reasonable, but this provision shall not entitle any person to compensation for services rendered in searching for a dead body.

Money or personal property found on dead bodies. P. S. 26, § 22. 1877, 200, § 19. 13 Allen, 465.

SECTION 22. In all cases arising under the provisions of this act, the medical examiner shall take charge of any money or other personal property of the deceased, found upon or near the body, and shall deliver the same to the person or persons entitled to its custody or possession, or, if not claimed by such person within sixty days, then to a public administrator to be administered upon according to law.

Penalty for neglect to deliver the same. P. S. 26, § 23. 1877, 200, § 20.

SECTION 23. A medical examiner who fraudulently neglects or refuses to deliver any such property to such person within three days after due demand upon him therefor, shall be punished by imprisonment in the jail or house of correction not exceeding two years, or by fine not exceeding five hundred dollars.

Account of expenses, their audit and payment. P. S. 26, § 24. 1877, 200, § 21.

SECTION 24. Every medical examiner shall return an account of the expenses of each view or autopsy, including his fees, to the county commissioners having jurisdiction over the place where the examination or view is held, or in the county of Suffolk to the auditor of the city of Boston, and shall annex to his return the written authority under which the autopsy was made. Such commissioners or auditor shall audit such accounts and certify to the treasurer of the commonwealth, or the treasurer of the county, as the case may be, what items in such account are deemed just and reasonable, and such items shall be paid by said treasurer to the person entitled to receive the same.

District-attorney's approval required. 1885, 379, § 7.

Every medical examiner shall forthwith file with the district-attorney of his district a report of each autopsy made by him, and of his view and personal inquiry in such case under the provisions of this chapter; and shall certify in such report that, in his judgment, the cause and manner of the death could not be ascertained by view and inquiry, and that an autopsy was necessary for that purpose. The district-attorney shall examine such report, and if of the opinion that such autopsy was necessary, shall, except in the county of Suffolk, so certify to the county commissioners

having jurisdiction over the place where the autopsy is held, and no fee for any autopsy shall be certified by the commissioners for payment until such certificate by the district attorney shall have been filed with said commissioners.

Annual report to Secretary of Commonwealth 1885, 379, § 3.

SECTION 25. Every medical examiner shall, annually, on or before the first day of March, transmit to the secretary of the commonwealth certified copies of the records of all deaths which have occurred during the year ending on the last day of the preceding December, the cause and manner of which he has investigated in accordance with the requirements of chapter twenty-six of the Public Statutes: *provided, however,* if the term of office of any medical examiner shall end before the said last day of December, he shall send to the secretary of the commonwealth, within the sixty days next ensuing upon the expiration of his commission as a medical examiner, certified copies of the records of all deaths officially investigated by him during that part of the then current calendar year in which he continued in office.

Fees for annual returns. 1885, 379, § 4.

SECTION 26. Each medical examiner shall be entitled to receive from the treasury of the commonwealth, for recording and returning the facts relating to deaths as herein provided, twenty cents for each of the first twenty entries, and ten cents for each subsequent entry in any year, as certified by the secretary of the commonwealth, and such allowance or payment shall be made to the medical examiners in Suffolk county for record and returns pursuant to this section, notwithstanding the limitation to their salary fixed by law. Any medical examiner shall forfeit not less than ten nor more than fifty dollars for each refusal or neglect to fulfil the requirements herein provided.

Proper blanks to be supplied to medical examiners. 1885, 379, § 5.

SECTION 27. The secretary shall, at the expense of the commonwealth, prepare and furnish to the several medical examiners, blank books of suitable quality and size, to be used as books of record, and blank forms for returns, on paper of uniform size.

Secretary to report a summary of medical examiners' returns annually, 1885, 379, § 6.

SECTION 28. The secretary shall cause the returns received by him for each year, in accordance with the provisions of the foregoing sections, to be bound together in one volume, with indexes thereto; he shall prepare, or cause to be prepared from the said returns, such tabular results as will render them of practical utility, and shall make report thereof annually to the general court in connection with the report of the registry and return of births, marriages, and deaths required by section fifteen of chapter thirty-two of the Public Statutes.

Medical Examiner to be notified of fatal railroad accidents. P. S. 112, § 208.

SECTION 29. Every railroad corporation shall give immediate notice of an accident on its road which is attended with loss of life to the medical examiner of the county residing nearest to the place of accident. For each omission to give such notice

the corporation shall forfeit a sum not exceeding one hundred dollars.

Death certificates required before burial or removal. P. S. 32, § 5.

SECTION 30. No human body shall be buried or removed from any city or town until a proper certificate has been given by the clerk or registrar to the undertaker, sexton or other person performing the burial or removing the body. Such certificate shall state that the facts required by chapter thirty-two of the Public Statutes have been returned and recorded; and no clerk or registrar shall give such certificate or burial permit until the certificate of the cause of death has been obtaiued from the physician, if any, in attendance at the last sickness of the deceased, and placed in the hands of said clerk or registrar; and in cities and towns where there are Boards of Health, the certificate of the cause of death shall also be approved by such Board before a permit to bury is given by the registrar or clerk. Upon application, the chairman of the Board of Health, or any physician employed by any city or town for such purpose, shall sign the certificate of the cause of death to the best of his knowledge and belief, if there has been no physician in attendance. He shall also sign such certificate, upon application, in case of death by dangerous contagious disease, or in any other event when the certificate of the attending physician cannot, for good and sufficient reasons, be early enough obtained. In case of death by violence, the medical examiner attending shall furnish the requisite medical certificate. Any person violating the provisions of this section shall be punished by fine not exceeding twenty-five dollars.

Certificate by a medical examiner required before cremation of a body. 1885, 265, § 4.

SECTION 31. No body of a deceased person shall be cremated within forty-eight hours after decease, unless death was occasioned by contagious or infectious disease; and no body shall be received or cremated by any corporation formed for the purpose of providing the necessary appliances and facilities for the proper disposal by incineration of the bodies of the dead, until its officers have received a certificate or burial permit required by law before burial, together with a certificate from the medical examiner of the district within which the death occurred, that he has viewed the body and made personal inquiry into the cause and manner of death, and is of opinion that no further examination nor judicial inquiry concerning the same is necessary. For such view, inquiry, and certificate he shall receive the fees prescribed by law for a view without an autopsy by examiners in counties other than Suffolk County. Medical examiners within their respective dis tricts shall make such view and inquiry upon application therefor and payment or tender of said fees.

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